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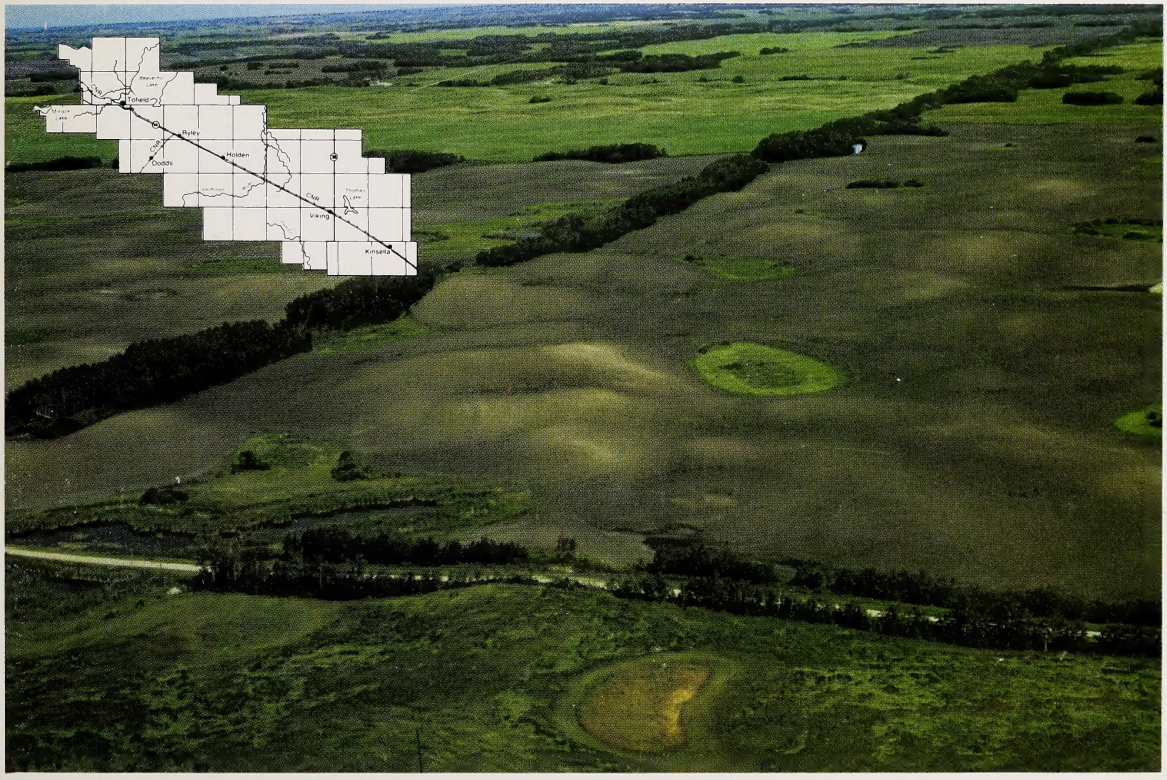
Soil survey of the

County of Beaver, Alberta

Alberta Soil Survey Report No. 47



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Soil survey of the

County of Beaver, Alberta

R.W. Howitt

Alberta Soil Survey Report No. 47

Soil mapping by

R.W. Howitt, N. Findlayson, M. Gowler, M. Riddell, and G. McEwan

Report compilation by

J. Lutz, W.L. Nikiforuk

Cover: Hummocky topography east of Viking.

TERRAIN SCIENCES DEPARTMENT, ALBERTA RESEARCH COUNCIL
EDMONTON, ALBERTA, CANADA 1988

How to use this report

To obtain data about the soil on a specific land location

1) Turn to page 65 and identify the area of interest and the mosaic on which it is found using township and range identifiers on the index to map sheets.
   Note: The county has been divided into 29 map sheets, each of which is presented on a single air photo mosaic.
   Graphic 1 (opposite page): overview of the county with a single section of land identified in a specified mosaic.
2) Turn to the appropriate mosaic starting on page 67 and using the township and range identifiers in the margins locate the the parcel of land of interest.
   Graphic 2 (opposite page): overview of mosaic 14 with the section of land from graphic 1 highlighted. The soil lines are highlighted.
   Graphic 3 (opposite page): identification of map units for section 8, township 49, range 16
3) Identify the soil unit(s) that are pertinent for the specified parcel of land (see example below), and turn to page 61 (Appendix D) to find where the information pertaining to this unit is found.

Portion of Appendix D indicating locations of information pertaining to soils and soil units of the County of Beaver.

Map unit	Page numbers on which data is presented for:				
	Soil descriptions	Unit descriptions	Interpretations for: agriculture capability	erodibility	Engineering properties
AGPH 2	13	13	29	31	-
AGPH 3	13	13	29	31	-
AGPO 2	13	13	29	31	-
AGS 2	13	13	29	31	33
AGS 3	13	13	29	31	33
AGS 7	13	13	29	31	33
AGS 8	13	13	29	31	33
AV	24	-	29	31	-
BS 1	24	24	29	31	-

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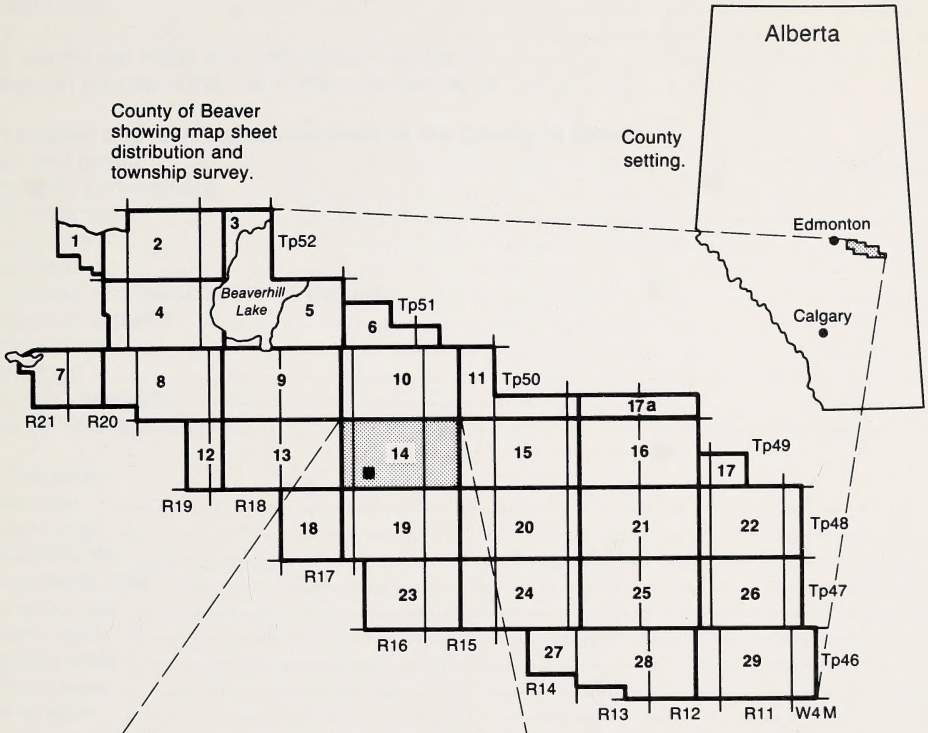
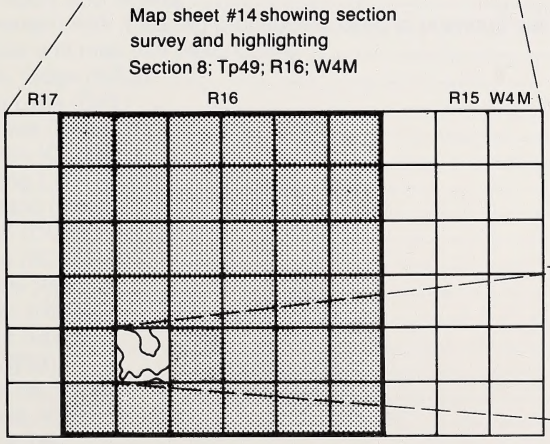
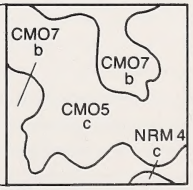
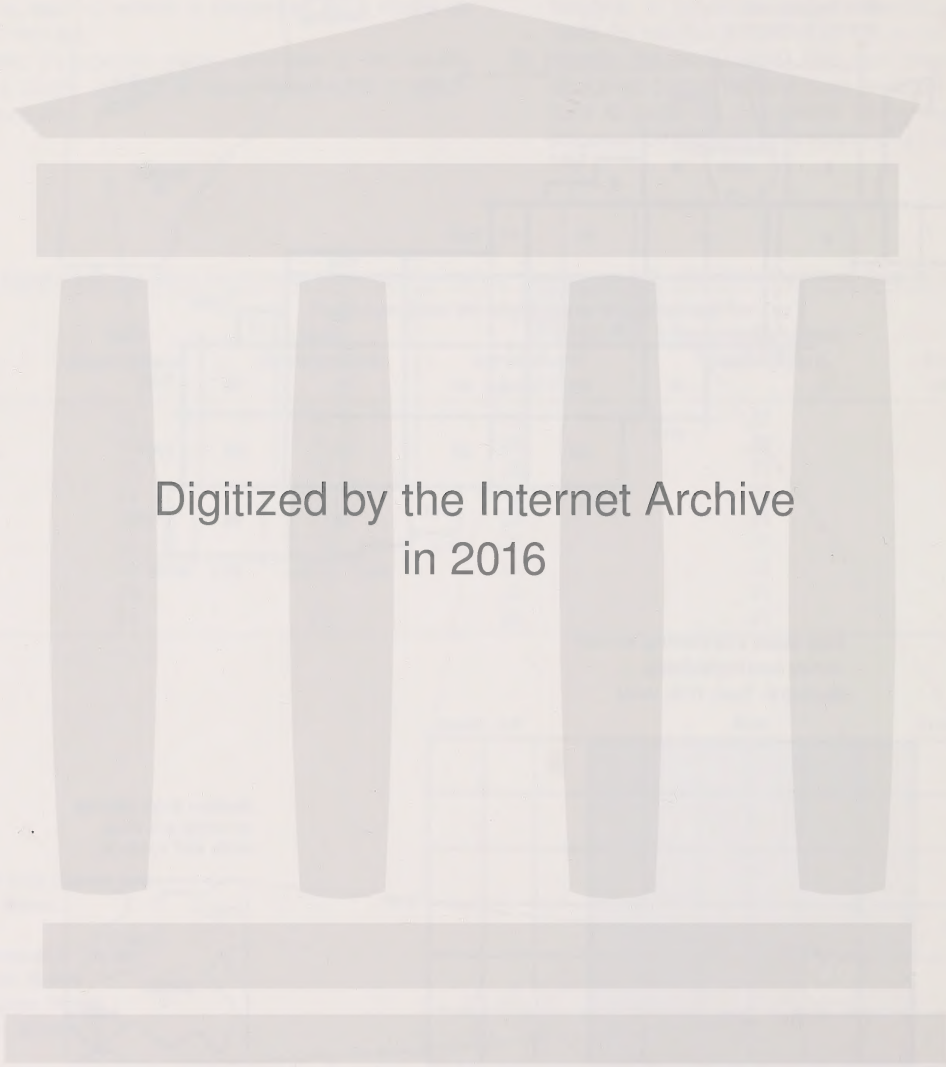

Alberta
County of Beaver showing map sheet distribution and township survey.
County setting.
Edmonton
Calgary
Beaverhill Lake
Tp52
Tp51
Tp50
Tp49
Tp48
Tp47
Tp46
R21
R20
R19
R18
R17
R16
R15
R14
R13
R12
R11
W4M


Map sheet #14 showing section survey and highlighting Section 8; Tp49; R16; W4M
R17
R16
R15 W4M
Tp49


Section 8-49-16W4M showing soil map units and symbols.
CMO7 b
CMO7 b
CMO5 c
NRM 4 c



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Acknowledgments

The soil survey of the County of Beaver was conducted by the Terrain Sciences Department, Alberta Research Council, as part of a joint project also involving Agriculture Canada and the University of Alberta.

Funds for the field work and for compilation of the soils maps were supplied by the Alberta Research Council. Costs for laboratory analysis were shared through cooperation between the Research Branch, Agriculture Canada and the Terrain Sciences Department, Alberta Research Council. Aerial photography and topographic maps were obtained from Alberta Energy and Natural Resources. The final maps were compiled and drafted by the Alberta Research Council. The Alberta Research Council funded the publication of this report.

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Note: Reports such as this often use virtually intact passages extracted from previously published material. The author would like to acknowledge the following soil survey reports which were used as source documents:

Soil survey of the Calgary urban perimeter, Alberta (MacMillan, R.A. 1987).

Soil Survey of the County of Two Hills No. 21, Alberta (Macyk, T.M., et al. 1985).

Soil Survey of the County of Warner No. 5, Alberta (Kjearsgaard, A.A. et al. 1984).

Summary

A soil survey of the County of Beaver was initiated at the request of the Department of Municipal Affairs. The soils of the county were originally mapped as part of the soil surveys of the Edmonton (Bowser et al., 1962) and Wainwright-Vermilion map sheets (Wyatt et al., 1944). These reconnaissance surveys were regional maps, lacking the detail required for many current land use decisions. The purpose of the soil survey of the County of Beaver was to re-map the soils at a scale of 1:50 000 and provide interpretations of the soil units for agricultural capability and potential erodibility. This new survey benefits from advantages derived from more intensive examination of soils in the field and use of new aerial photographs.

The report consists of three parts. Part 1 is a description of the location and the physical environment of the county. Part 2 contains a description of the soils and the soil units, which are used to describe the composition of delineations on the map. In Part 3, the soil units are interpreted for soil capability for agriculture and soil erosion potential. Appendices A to C include data pertinent to the classification, interpretation and evaluation of the soil units.

Twenty-nine aerial photo mosaics accompany this report. The mosaics, presented at a scale of 1:50 000, show the location and extent of individual soil delineations, major towns and roads. Township and range numbers as well as mosaic numbers are shown on the margins of each mosaic. The relationship of mosaics, with respect to one another and with respect to township and range for the whole county, is presented in figure 8 which is an index to the map sheets.

How to use the soil maps and interpretations tables

The soil maps of the County of Beaver are included in this report. Each outlined area on a map contains a notation indicating the soil unit and phase which best describes that area. This notation acts as a key which allows the user to locate a description of that area in the legend and in the report.

Interpretations have been made for each unique soil unit notation found on the maps. A user has only to determine the symbol which describes a particular area of interest and then locate that symbol in the appropriate interpretations table or map legend. All soil unit symbols are arranged alphabetically within the tables to allow for easy location. In order to fully understand the interpretations for any unit, it is recommended that the user read carefully the description of that unit found in the preceding chapter. The descriptions provide information about the complexity of soils and parent materials found within the units and include statements relating to the variability of important unit properties.

Limitations in the use of this map and report

The user is cautioned against uncritical acceptance of the information contained on the map and of interpretations based on it. It should be noted that more than 99 percent of the area covered by a soil map is never investigated below the surface. Thus, most of each outlined area is described on the basis of a few observations within that area. Obviously, soils may exist within a delineation which may not have been encountered during investigations of that area. These soils may differ considerably from those which are described as having been found in the area. Thus the map is not intended to show site-specific data and should not be used in lieu of site investigations. For design purposes, a site investigation by specialists should always be made. The information given here, however, can be used for general assessment and, for the specialist, it should prove to be an excellent guide for planning effective investigations.

It should also be noted that each mosaic represents a composite made up from many individual aerial photographs, and as such, is uncontrolled with respect to scale. Due to distortions in the photography, scale may vary slightly across individual mosaics. This is often reflected in small discrepancies across the length of a boundary between adjoining mosaics. This discrepancy must be accounted for by shifting mosaics slightly to ensure registration of the area of interest.

Part 1. Location and physical environment of the County of Beaver

Location and extent

The County of Beaver is located in east central Alberta (figure 1). The county trends in a southeasterly direction along Highway 14 from Lindbrook to just past Kinsella. The western border is approximately 50 km east of Edmonton and the eastern border is approximately 50 km west of Wainwright. Major towns in the county include Tofield, Ryley, Holden, Bruce, Viking and Kinsella.

The county comprises 37 townships (344 400 ha) ranging from township 52, range 20 to township 46, range 10 west of the fourth meridian. The majority of the county lies on the Edmonton (83H) 1:250 000 NTS map sheet and lesser portions lie within the Vermilion (73E) and Wainwright (73D) 1:250 000 map sheets.

Physiography and drainage

The county occupies a portion of the Eastern Alberta Plain as delineated by Bostock (1970). The county can be further subdivided into sections and districts (table 1). The location and extent of each district is shown in figure 2.

The Beaverhill Upland is an area of hummocky moraine characterized by a complex sequence of hummocks with short steep slopes interspersed by numerous pothole lakes and sloughs. This is the highest of the districts ranging in elevation from 660 to 775 m.

The eastern portion of the Beaverhill Upland is drained by Katchemut, Hastings and Wakinagan creeks which flow into Beaverhill Lake. The western portion of the upland lacks an integrated drainage system as a result of the hummocky topography.

The Daysland Plain is an extensive area of undulating ground moraine characterized by gentle to moderate slopes with numerous sloughs in the lower slope positions. This district is moderately flat ranging from 670 to 700 m.

The Daysland Plain is drained by Amisk Creek in the west, Iron Creek in the southeast and the Vermilion River in the central portion. Iron Creek flows to the Battle River, while waters from Amisk Creek and the Vermilion River flow to the North Saskatchewan River. A man-made ditch provides drainage from the Holden Drainage District to the Vermilion River.

The Torlea Flats is an area of undulating to flat ground moraine characterized by gentle slopes, numerous small sloughs and several very large sloughs. This district is differentiated from the Daysland Plain on the basis of the nature of the surficial materials and the shallow depth to bedrock. Elevation ranges from 670 to 685 m. The flats are drained by the Vermilion River in the north and to a lesser extent by Iron Creek in the south.

The Viking Upland is an area of hummocky moraine characterized by hummocks with short steep slopes interspersed by numerous pothole lakes. The elevation ranges from 670 to 700 m. There are no major creeks through this district, but several lakes (Thomas, Vernon, Hattie and Camp) have formed in association with a meltwater channel which traverses north to south through the district.

Table 1. Physiographic regions of County #9.

Region	Section	District	Landform
Eastern Alberta Plain	Cooking Lake Upland	Beaverhill Uplands 760 to 775 m	Morainal hummocky
	Sullivan Lake Plain	Daysland Plain 608 to 730 m	Morainal undulating
		Torlea Flats	Morainal veneer over residual undulating
	Vermilion Uplands	Viking Upland 608 to 760 m	Morainal hummocky

Source: Physiographic Subdivisions of Alberta (Agriculture Canada 1986).

Surficial materials

Glacial history

The surficial materials in the county are a result of glaciation (during the late Wisconsin) which ended approximately 10 000 years ago. Glaciers covered the plains of east central Alberta. When the ice melted, the material contained therein was left behind. The hummocky topography found on the Beaverhill and Viking Uplands is the result of the melting and disintegration of a stagnant ice mass. The undulating topography of the Daysland Plain and Torlea Flats is the result of the melting of a retreating glacier.

Till deposits

The county is covered almost entirely by till, an unsorted sediment deposited directly from a glacier and composed of varying proportions of materials eroded by the glacier upstream from deposition (Bayrock and Hughes, 1972).

For the purpose of this soil survey, two tills were differentiated. The first and most common is a yellowish-brown till, comprised of approximately equal parts of sand, silt and clay and has a gravel content of less than 10 percent. Numerous lenses of silt, sand and gravel within the morainal landforms resulted from

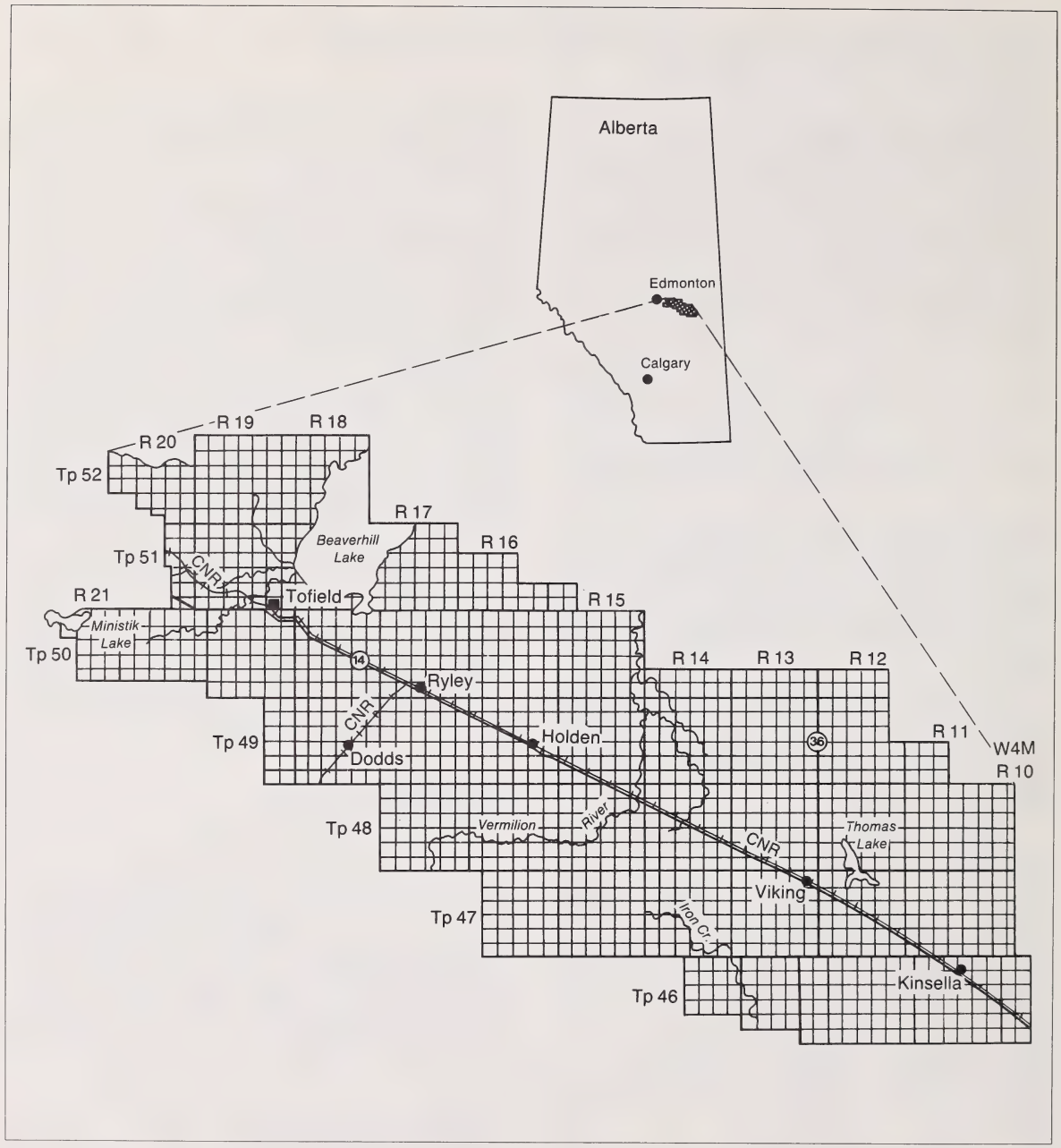

Figure 1. Location of the County of Beaver.

sorting of glacial debris by meltwater from the glacier ice. The till blanket is thicker on the Beaverhill Upland (12 to 46 m) than on the Daysland Plain (3 to 12 m).

A second till has been recognized on the Daysland Plain (Westgate, 1969; Warren, 1937) and on the Torlea Flats (Wyatt et al., 1944). It was described by Westgate as a grayish brown, bentonitic lower till compared to the yellowish brown upper till. Deposits of the gray till dominate the Torlea Flats and occur randomly throughout the Daysland Plain. Ellwood (1969) did not differentiate between the till on the Daysland Plain and Viking Upland.

Glaciofluvial and glaciolacustrine deposits

Portions of the county are covered with glaciofluvial or glaciolacustrine materials that are a result of sorting of

Plate 1. The Beaverhill Upland is characterized by hummocky topography and much of the upland is wooded.

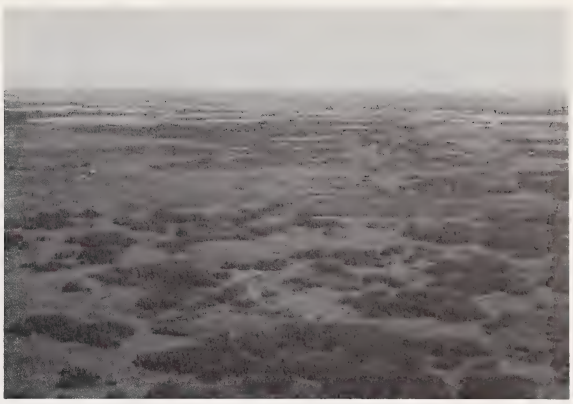

Plate 2. The Torlea Flats is an area of scrubland where solonetzic soils have developed on gray till.

the till by meltwater from the glacier ice. Of note are sand and gravel deposits in the Kinsella area and sand deposits in the vicinity of Beaverhill Lake. Throughout the remainder of the county, thin veneers of sandy or silty material occur randomly and infrequently.

Post-glacial deposits

Fluvial material occurs mainly in active stream channels and around the shorelines of Beaverhill and Birch lakes where fluctuating water levels maintain a dynamic equilibrium. These materials are generally sandy to silty.

Bedrock geology

The bedrock geology of the area has been discussed in the literature at some length. The most recent information about the distribution of the bedrock geology in the province is reported by Green (1972).

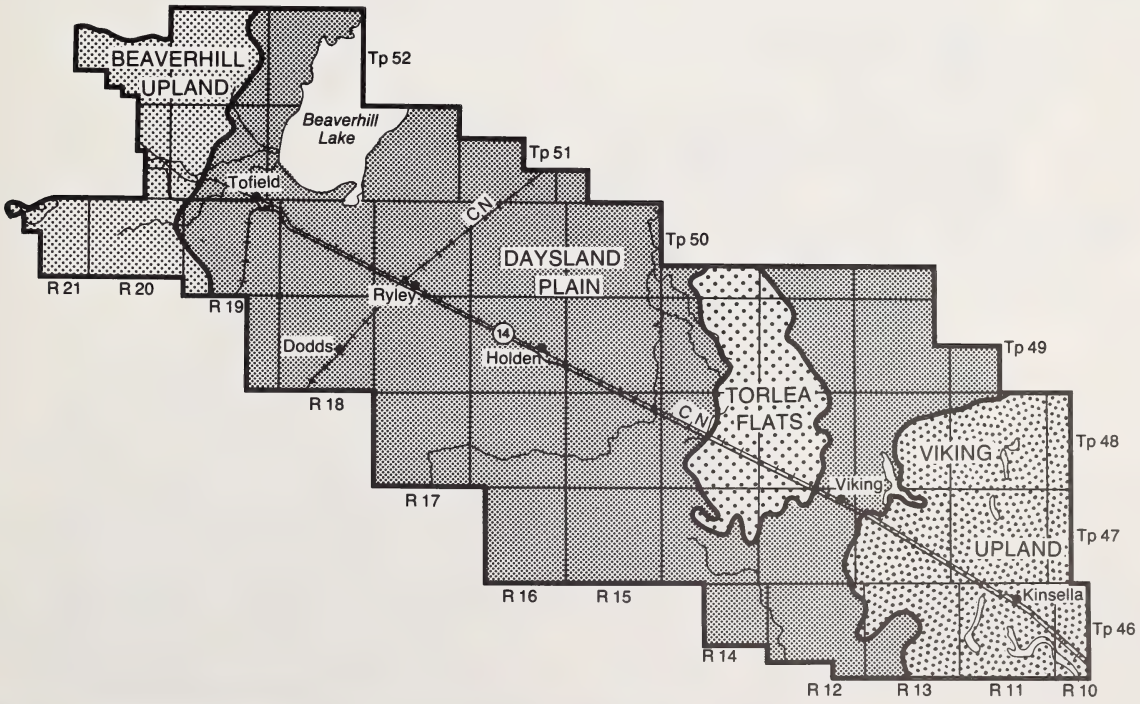

Figure 2. Location and extent of physiographic districts in the County of Beaver.

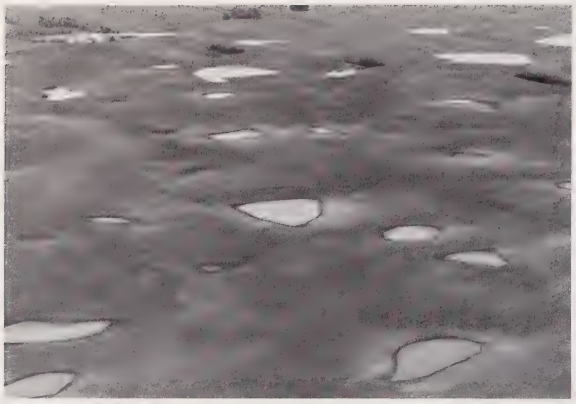

Plate 3. Numerous pothole sloughs on undulating and hummocky landscapes present difficulties for farming operations and in some situations may be salinized thus causing even greater problems.

There are three bedrock formations which underlie surficial materials in the county; the Horseshoe Canyon, Bearpaw and Belly River formations.

These are upper cretaceous sediments – Belly River is the oldest and the Horseshoe Canyon is the youngest. The Bearpaw was marine deposited, while the Belly River and Horseshoe Canyon were deposited in non-marine environments. The Bearpaw is composed mainly of shales and clayey sandstone. The others are composed of sandstone, mudstones and siltstones. All contain concretionary ironstone beds. Scattered coal seams in the Horseshoe Canyon have been mined in the county and this has resulted in some limited surface disturbance. Figure 3 is a generalized map delineating each of the three bedrock formations.

Hydrogeology

The groundwater resources of the county are discussed in detail by Stein (1982), Currie and Zacharko (1976), and Hackbarth (1975). Groundwater is used primarily for domestic and stock watering and only rarely for municipal supply. Water yield from aquifers in the county is highly variable, ranging from less than 0.1 L per second to 8 L per second. Yield is generally related to bedrock geology. Fractured coal beds in the Horseshoe Canyon Formation deliver the highest yields, whereas unfractured coal zones of the same formation yield substantially less. The Bearpaw and upper Belly River formations deliver the lowest yields.

Four zones with chemical characteristics distinctive of near-surface bedrock aquifers were identified (Stein, 1982) for the southeast segment of the Edmonton sheet. These zones are delineated in figure 4 for the entire county. Extrapolation of these zones to the Vermilion and Wainwright sheets was done in consultation with R. Stein. The western portion of the

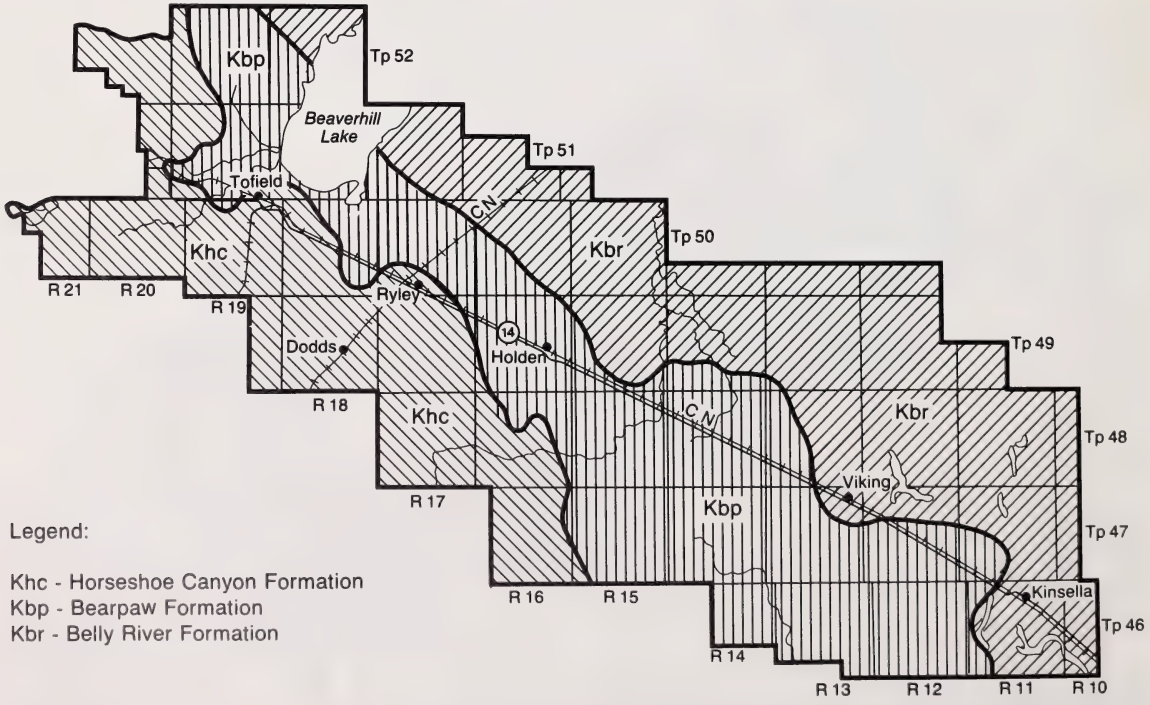

Figure 3. Location and extent of bedrock formations in the County of Beaver.

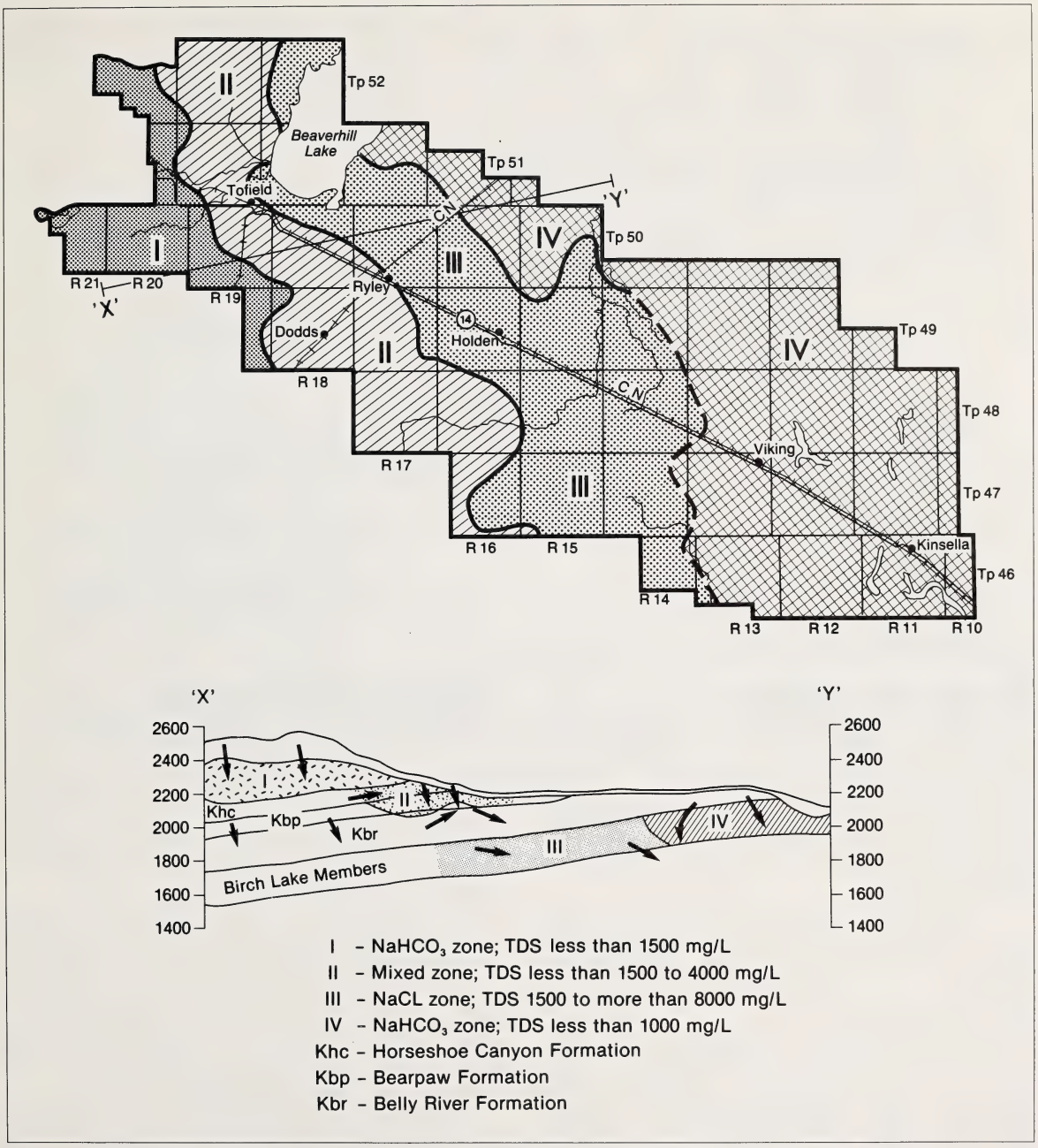

Figure 4. Location, extent and chemical characteristics of near surface aquifers in the County of Beaver.

county is characterized by sodium bicarbonate water with total dissolved solids of less than 1000 mg/L. A mixed zone, consisting of sodium chloride, sulphate and bicarbonate waters with total dissolved solids of 1500 to 4000 mg/L, borders the eastern boundary of the first zone. A third zone of sodium chloride water with total dissolved solids as high as 10 000 mg/L occupies a significant portion of the county east of Tofield. Finally, a zone of sodium bicarbonate water with total dissolved solids of less than 1000 mg/L is found in the north-eastern portion of the county. The distribution of these zones is related to position in the bedrock aquifers and in the groundwater flow systems.

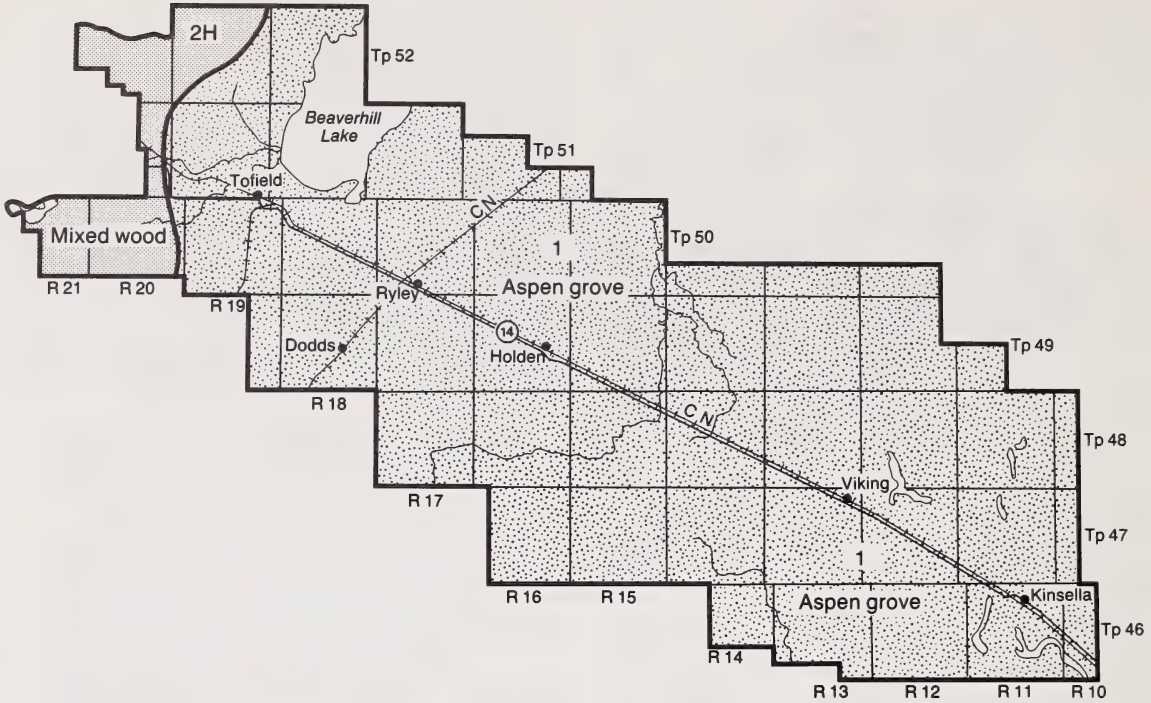

Figure 5. Climatic and vegetation zonation in the County of Beaver.

Climate and vegetation

The majority of the county falls into agroclimatic zone 1 (figure 5) (Bowser, 1967). Agroclimatic zone 1 is defined as having sufficient rainfall (400 to 460 mm) and frost-free period (90 days on average) to permit the growing of all of the dryland crops that are typical to the prairie region in western Canada. A segment of the northwest portion of the county is classified as agroclimatic zone 2.

In zone 2, precipitation is generally adequate for crop production, but the frost-free period is somewhat shorter (75 to 90 days) than in zone 1. Meteorological data for recording stations in and around the county is available from the Atmospheric Environment Service, Government of Canada.

Vegetation is strongly influenced by climate; thus the vegetation zonation parallels the climate zonation (figure 5). The Beaverhill Upland is part of the mixed wood forest region (Rowe, 1972), while the Daysland Plain, Torlea Flats and Viking Upland are part of the aspen grove forest region. The mixed-wood region is characterized by a mixture of trembling aspen and balsam poplar, white and Alaska birches, white spruce and balsam fir. The aspen grove region is described as consisting of dominantly aspen with some balsam poplar and white birch. The Beaverhill Upland and part of the Viking Upland remain under forest cover, while the Daysland Plain has been cultivated.

General soil characteristics

The soils in the County of Beaver can be viewed as a function of the environments in which they have formed. The following is a discussion of the soils in the county in relation to physiography, surficial materials, climate and vegetation. Table 2 is a summary of the soil orders mapped in the county, their distinguishing features, where they are mapped and the factors important to their occurrence.

The Beaverhill Upland is dominated by soils of the Luvisolic and Organic orders. This is a result of a cool climate and the dominance of forest vegetation. Luvisolic soils are formed under forest cover where a paucity of organic matter, rapid decomposition of organic material and strong leaching conditions result in low organic matter content and poor structure in the surface horizon. The soil has low inherent fertility and is prone to crusting following heavy rainfall.

Organic soils form in depressional areas where poor drainage and aeration result in slow decomposition of organic material. The remains of the dominant sedge vegetation have accumulated over time to a depth often in excess of 2 m. Because these soils are wet throughout much of the year, they have little potential for grain production.

The Daysland Plain is dominated by Solonetzic soils and the Viking Upland by Chernozemic soils. The dominance of grassland vegetation and a warm cli-

Table 2. Summary of soil classification and genesis of soils mapped in the County of Beaver.

Soil order	Description	Where mapped	Important factors of formation
Chernozemic	deep, well and imperfectly drained, black grassland soils	Daysland Plain Viking Upland	- no sodium salts in parent material - grassland vegetation - 10 to 15 m of till over bedrock
Gleysolic	deep, poorly drained, black grassland soils	Daysland Plain Viking Upland	- depressional slope position; - water accumulation - poor drainage - grassland vegetation
Luvisolic	deep, well drained, light colored forest soil	Beaverhill Upland	- forest vegetation - cool climate
Organic	deep, poorly drained, decomposed	Beaverhill Upland	- depressional slope position - sedge vegetation - cool climate - water accumulation - poor drainage
Solonetzic	deep, well and imperfectly drained, black grassland soil with dense, impermeable B Horizon	Daysland Plain Torlea Flats Viking Upland	- sodium salts in parent material - less than 10 m of till over bedrock - grassland vegetation
Regosolic	rapidly to poorly drained, weakly developed soils	Daysland Plain Viking Upland	- recent deposition of parent material

mate is thought to be responsible for the development of the black surface horizon that is characteristic of these soil orders. The presence of the columnar round-topped solonetzic B horizon is a result of salinization and subsequent leaching of the salts from the upper solum. Chernozemic soils have not been subjected to the salinization process or have been only weakly salinized. Consequently, the B horizon does not demonstrate the structure of the Solonetzic soils.

Gleysolic soils are found in wet depressional areas on the Daysland Plain and Viking Upland. Sedge vegetation is dominant in these areas, however, the warm climate has resulted in humification of the organic material and the development of thick black surface horizons.

Part 2. The soils

Soil formation

Soil genesis is considered to be a function of several factors of soil formation: climate, plant and animal life, parent material, relief and time. These factors in combination affect the physical, chemical and morphological properties of the soil, which are the determinants of soil classification and which affect the interpretation of soils for various uses.

Climate (precipitation, temperature and wind) governs the type and amount of vegetation, the degree of biological activity in the soil and the extent to which soil erosion will occur. Further, climate influences the rate of mineral weathering and the leaching of weathered materials in the solum.

All living organisms (plants, animals, bacteria and fungi) are important to soil formation. Vegetation contributes organic residues to the soil which influence the color, structure, reaction and fertility of the soil. These properties influence the capability of the soil for agricultural production and the susceptibility to erosion. Soil animals and micro-organisms break down organic residues, thus releasing nutrients for plant use. Man's activities are also of considerable importance in soil formation.

The parent material is the raw material acted upon, over time, by climate and vegetation. Soil texture, mineralogy and chemistry are influenced strongly by the parent material. These properties are of importance to the rate of water movement through the soil, moisture-holding capacity, nutrient status and potential erodibility.

Relief refers to the topographic position and slope orientation of the soil profile. Topographic position, in terms of elevation, determines the relationship of the soil profile to the groundwater flow system and to an extent, climate and vegetation. Changes in elevation may result in changes in the climatic parameters of temperature and moisture regime. Relief also influences the amount of runoff and the depth of the water table.

Over time, the influence of climate (rain, temperature, wind), vegetation and parent material impart distinctive features to the soil. Most soils in east-central Alberta have formed since the last glaciation some 10 000 years ago. Some soils have formed very recently as a result of deposition or erosion.

Soil morphology

The results of the soil-forming factors can be distinguished by different layers or soil horizons seen in a soil profile (figure 6). The profile extends from the surface downward to material that is little altered by the soil-forming process. Soil horizons differ from one another in one or more of the following features: color,

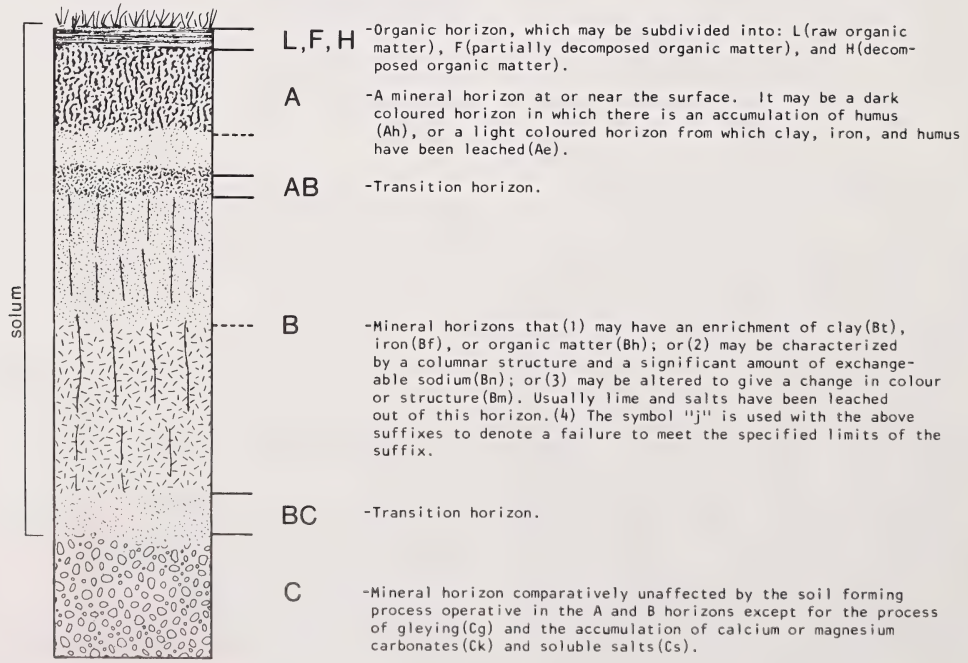
solum
L,F,H
-Organic horizon, which may be subdivided into: L(raw organic matter), F(partially decomposed organic matter), and H(decomposed organic matter).
A
-A mineral horizon at or near the surface. It may be a dark coloured horizon in which there is an accumulation of humus (Ah), or a light coloured horizon from which clay, iron, and humus have been leached(Ae).
AB
-Transition horizon.
B
-Mineral horizons that(1) may have an enrichment of clay(Bt), iron(Bf), or organic matter(Bh); or(2) may be characterized by a columnar structure and a significant amount of exchangeable sodium(Bn); or(3) may be altered to give a change in colour or structure(Bm). Usually lime and salts have been leached out of this horizon.(4) The symbol "j" is used with the above suffixes to denote a failure to meet the specified limits of the suffix.
BC
-Transition horizon.
C
-Mineral horizon comparatively unaffected by the soil forming process operative in the A and B horizons except for the process of gleying(Cg) and the accumulation of calcium or magnesium carbonates(Ck) and soluble salts(Cs).

Figure 6. Diagram of a soil profile showing various horizons.

texture, structure, consistence, reaction and thickness. Most soils have three master horizons: the A, B and C.

The surface horizon is designated by Ap or Ah. The suffix p indicates a surface layer that has been plowed at regular intervals. The suffix h indicates a surface layer relatively undisturbed by man. The A horizon is also the layer of maximum leaching, or eluviation of clay and iron. Such a horizon is designated as Ae. The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation of clay (Bt), iron (Bf), or organic matter (Bh). The C horizon, which is below the A and B horizons consists of material that is little altered by soil-forming processes.

Soil classification

Soil classification is the grouping of soils into categories based on the similarity of soil properties. In Canada, soils are classified according to the Canadian System of Soil Classification (Canada Soil Survey Committee, 1978). The broadest category in the system is the order and is based on properties of the soil that reflect the nature of the soil environment and the effects of the dominant soil-forming processes.

The Canadian system is a hierarchical one in which the classes are based on the generalization of soil properties. The various soil units are classified into their respective orders, great groups and subgroups. Readers interested in the details of the system should refer to this publication. The following is a brief description of the soil orders found in the County of Beaver.

Chernozemic soils

These are well to imperfectly drained soils developed under grassland or transitional grassland-woodland vegetation. They are characterized by a dark colored, organo-mineral (Ah) surface horizon and B and C horizons of high base saturation. In the County of Beaver, soils of the Black and Dark Gray great groups are represented. Soils of the Black great group have an Ah horizon that is dark gray to black in color and usually over 10 cm in thickness. Soils of the Dark Gray great group have an Ah horizon that contains light gray spots or bands and usually a lighter colored Ahe horizon. Chernozemic soils in the County of Beaver are found in the northwestern portion of the county on the boundary of the Beaverhill Upland and on the Daysland Plain in association with Solonetzic soils. The Chernozemic soils in the County of Beaver include Angus Ridge, Camp Lake, Elnora, Heisler, Irma, Kinsella, Norma, Peace Hills, Ponoka and Thomas Lake soils.

Solonetzic soils

This order of soils consists of well to imperfectly drained soils developed under a variable vegetative cover. They are characterized by solonetzic B horizons and saline parent material. A guide in the characterization of these soils is provided by chemical criteria, but separations made at the great group level are based mainly on the morphological differences evident in the soil profile. These morphological features relate mainly to the presence or absence of transitional AB horizon and on the nature of the B horizon. Soils of the Solonetz and Solodized Solonetz great groups are characterized by an abrupt change from the A to the very hard columnar B horizon. Plant roots tend to concentrate along the contact between the friable A horizon and the hard B horizon. The roots that do penetrate usually follow along the cleavage faces and are flattened. Soils of the Solod great group have a transitional AB horizon to the Bnt. Solonetzic soils occur in the central portion of the county, on the Daysland Plain. The Black Solonetzic soils in the County of Beaver include Camrose, Daysland, Daugh, Gadsby, Killam and Shonts soils.

Luvisolic soils

These are well to imperfectly drained soils that have formed under forest or forest-grassland vegetation in moderate to cool climates. All soils in this order have a pronounced eluvial Ae horizon and an illuvial textural Bt horizon in which silicate clay is the main accumulation product.

Orthic Gray Luvisols represent the central concept of the great group as defined. Where an Ah horizon is present it is less than 5 cm thick. Dark Gray Luvisols have the general characteristics of the great group but the Ah or Ahe horizon is more than 5 cm thick. The Ah and/or Ahe horizons contain gray streaks that are most readily seen when the soil is dry.

Two subgroups of the Luvisolic order are found in the county; Orthic Gray Luvisols and Dark Gray Luvisols. Luvisolic soils are dominant in the north western portion of the county on the Beaverhill Upland and include Cooking Lake, Leith, Macola, Maywood and Uncas soils.

Regosolic soils

Regosols include rapidly to poorly drained soils that lack discernible horizons or have only Organic (L-H) or nonchernozemic organo-mineral (Ah) surface horizons. The Orthic and Cumulic Regosols are the only subgroups found in the map area. These soils occur as part of the undifferentiated Alluvium, Beach Sand, and Rough Broken miscellaneous land types.

Gleysolic soils

These soils are poorly drained and have strongly gleyed mineral horizons. They have developed under varying climatic conditions and vegetative cover types in the presence of a high or a fluctuating water table. These soils may have organic surface horizons up to 60 cm in thickness and are characterized by dull

Plate 4. Chernozemic soils are most common on the Viking Upland but are also found in association with Solonetzic soils on the Daysland Plain.

Plate 5. Solodized Solonetzic soils are most common on the Daysland Plain and on the Torlea Flats.

grayish colors throughout the profile. Prominent yellowish or reddish colored mottles may also be present.

Criteria related to classification at the great group level are provided by the characteristics of the A horizon. In the County of Beaver, the Humic Gleysol has been recognized as the dominant Gleysolic soil. The Humic Gleysol great group consists of soils that have an Ah horizon more than 8 cm in thickness but have no eluviated Aeg horizon. The Luvic Gleysol great group is comprised of soils characterized by a prominent Aeg horizon.

Poor drainage is a dominant factor in the development of Gleysolic soils and often there is little difference in profile characteristics over a fairly wide range of parent materials. Gleysolic soils are dominant in a minor portion of the area but frequently occur in association with the better drained upland soils. The Haight series is the only Gleysol named and mapped in the County.

Plate 6. Orthic Gray Luvisols are most common on the Beaverhill Upland but may be found on wooded north facing slopes on the Viking Upland. These soils are limited for agricultural capability by low fertility, topographic factors, climate and adverse soil structure.

Organic soils

Organic soils are very poorly drained and are characterized by a surface accumulation of peat 40 cm or more in thickness (60 cm if fibric sphagnum moss is dominant). The peat has an organic carbon content greater than 17 percent. Organic soils mapped in the County of Beaver were developed from sedges and are classified as Typic and Terric Mesisols. The Chatwin series is the only Organic soil mapped in the county and is found on the Beaverhill Upland.

Mapping procedures

The purpose of a soil survey is to identify and delineate repeating soil patterns in the landscape and to provide interpretations of the soil units for various land uses.

Field work in the County of Beaver was initiated in 1978 and completed in 1983. The soils were examined and described according to the Canadian System of Soil Classification (Canada Soil Survey Committee, 1978). Field mapping was carried out with the aid of 1:31 680 panchromatic aerial photographs flown in 1975. Upon completion of the field work, the data were checked, compiled and published on air photo mosaics at a map scale of 1:50 000.

The area was traversed mainly by vehicle, or on foot where roads were unavailable or where more detailed investigations were required. Soil observations along roads were spaced at 0.3 to 0.5 km intervals. Soil observations at each site included an appraisal of the soil parent material, soil profile, drainage, texture, stone content, depth to carbonates or salts and characteristics of the landform and topography. Soil samples of representative soil profiles were collected for laboratory investigation at selected locations for selected soil series.

Map symbols and legend

The purpose of soil mapping is to separate the landscape into identifiable and repeating units. The units are referred to as map units and are defined in terms of the soil and landscape features they represent. Each delineation on the map is identified with a symbol as a member of a specific map unit.

Map units are named after the soil group which occupies the majority of the unit. A soil group is a group of closely related soil series developed on similar parent material under similar climate. Soil groups are identified by a unique three letter code, generally derived from the series name. For example, the code for Angus Ridge soils is AGS. This implies that all the soil units included within that soil group are located within the same agroclimatic zone and all are dominantly the same parent material. The broad soil groups are subdivided into soil units which, while dominantly composed of the naming series, have significantly different combinations of included soils, drainage conditions or surface form.

Units with the same soil group name may be differentiated on the basis of the presence of a significant (15 to 30 percent) proportion of different or contrasting soils. If the soils are developed on the same parent material and under the same climate, this differentiation is noted in the map unit number. Within a given unit, there may be inclusions (5 to 15 percent) of other soils that do not necessitate a change of unit. These soils are recognized in the soil unit descriptions but their presence does not influence interpretation or unit designation.

If soils on different parent materials are present in a unit, the symbol for the soil group is changed to a four letter code to reflect the soils present. For example, if there are Ponoka soils which have developed on glaciofluvial material mixed with Angus Ridge soils which have developed on till and these cannot be separated into different units, the symbol AGPO will be used.

Two further conventions are employed to convey information about the soils and landscapes on the map. The first is the use of a phase modifier which is used to identify pertinent features of the landscape not reflected in soil taxonomy. The first phase modifier was used to recognize the presence of washed soils (w) in a particular delineation of a given map unit. This modifier is used only with Cooking Lake map units. The second phase modifier was used to identify map units with severe wind erosion. This modifier (D2) was used with map units in the Beaverhill Lake Basin. The second convention is the use of a two-letter code to designate miscellaneous land types. These areas are described in terms of the landform or land use rather than as a soil unit. For example, areas that have been surface mined for coal reflect this process rather than the original soils or landform.

On the soil map, each individual soil area is enclosed by a boundary line. The soil area within each boundary is identified by a symbol arranged in the following sequence:

SOIL GROUP – MAP UNIT
Topographic Class

An example of a symbol is AGS 7d. This symbol describes an area of Angus Ridge soils, map unit 7 which is comprised of 70 percent Angus Ridge (Eluviated Black Chernozemic) soils and 30 percent Dark Gray soils of the Chernozemic and Luvisolic orders. The unit is mapped on topography class d (6 to 9 percent slope).

The topographic class is shown in the denominator of the symbol found in each area delineated on the map. The letter used to describe the topography represents the dominant slope range in each area. In some areas, slopes may occur that fit more than one topography class in each delineated area. In such cases, a combination of slope class designations is used. For example, if an area is characterized by e and f slopes, then the symbol ef was used to describe the area. A definition of each of the topographic classes is presented in Appendix B.

On page 159 of this report, an index map shows the location of the 29 individual soil map sheets which are presented on a photo mosaic base. This index map will help locate of areas of interest to the reader.

A comparison with mapping procedures used in previous soil surveys

This section is included to explain the categories and terminology employed in the legend and how they relate to those used in previously published soil surveys covering this area, that is the Wainwright-Vermilion Sheets (Wyatt et al., 1944) and Edmonton Sheet (Bowser et al., 1962).

In the Wainwright-Vermilion report, the soils were described by a three-digit number system. The first digit designated the soil zone, the second the parent material and the third profile variation. For example, a soil designated as 4.2.2. referred to a Black soil developed on glacial till with normal profile development.

The concept of the soil series was adopted for the soil survey of the Edmonton Sheet. The soil series was defined as a soil body such that any profile within the body has a similar number and arrangement of horizons with similar properties. The soil series was used as a mapping unit and was complexed with other soil series to describe map delineations.

In this study, soil groups were mapped alone or in combination with other soil groups to form soil units. Soil groups are composed of closely interrelated soil series developed on similar parent materials under similar climate. Soil units are conceptual models of

unique combinations of soil components, surface form and drainage conditions. They are based on the observation that relationships exist between observable landscape and the soils which occur on the landscapes. Soil units are generalized descriptions of what may be expected within any given delineation rather than an absolute statement of soil composition. The idea that map delineations with the same soil unit name are similar in most, but not all, respects is fundamental to the mapping procedure used in this survey.

A summary of the soil groups and their distinguishing features is presented in table 3.

The changes in classification and mapping procedures are a result of advancement in technology and knowledge of the soils and of adopting of more detailed mapping scales in recent soil surveys.

Table 3. Summary of soil group classification, parent material, texture, climate zone and physiographic district.

Soil group	Soil order	Subgroup	Parent material	Family particle size class	Climate zone	Physiographic district
Angus Ridge	Chernozemic	Eluviated Black	Till	Fine Loamy-Fine Clayey	1	Daysland Plain
Camp Lake	Chernozemic	Orthic Black	Glaciofluvial	Sandy	1	Viking Upland
Chatwin	Organic	Typic Mesisol	Organic	Mesic	2H	Beaverhill Upland
Camrose	Solonetzic	Black Solodized Solonetz	Till	Fine Loamy-Fine Clayey	1	Daysland Plain
Cooking Lake	Luvisolic	Orthic Gray Luvisol	Till	Fine Loamy-Fine Clayey	2H	Beaverhill Upland
Daugh	Solonetzic	Black Solonetz	Glaciolacustrine	Fine Clayey	1	Daysland Plain
Daysland	Solonetzic	Black Solod	Till	Fine Loamy-Fine Clayey	1	Daysland Plain Viking Upland
Elnora	Chernozemic	Orthic Black	Till	Fine Loamy-Fine Clayey	1	Viking Upland
Gadsby	Solonetzic	Black Solodized Solonetz	Glaciolacustrine	Fine Clayey	1	Daysland Plain
Haight	Gleysolic	Orthic Humic	Lacustrine	Fine Clayey	1	Viking Upland Torlea Flats
Heisler	Chernozemic	Solonetzic Black	Till	Fine Loamy-Fine Clayey	1	Daysland Plain Viking Upland
Irma	Chernozemic	Orthic Black	Glaciofluvial	Coarse loamy	1	Daysland Plain Viking Upland
Killam	Solonetzic	Black Solodized Solonetz	Till	Fine Loamy-Fine Clayey	1	Daysland Plain Viking Upland
Kinsella	Chernozemic	Orthic Black	Glaciofluvial	Sandy skeletal	1	Viking Upland
Leith	Luvisolic	Dark Gray Luvisol	Glaciofluvial	Coarse Loamy	2H	Beaverhill Upland
Macola	Luvisolic	Dark Gray and Luvisol	Glaciolacustrine	Fine Clayey	2H	Beaverhill Upland
Norma	Chernozemic	Solonetzic Black	Till	Fine Loamy-Fine Clayey	1	Daysland Plain
Peace Hills	Chernozemic	Orthic Black	Glaciofluvial	Coarse loamy	1	Daysland Plain
Ponoka	Chernozemic	Orthic Black	Glaciofluvial	Fine Loamy	1	Daysland Plain
Shonts	Solonetzic	Black Solodized Solonetz	Till	Fine Loamy-Fine Clayey	1	Torlea Flats Daysland Plain
Thomas Lake	Chernozemic	Orthic Black	Glaciolacustrine	Fine Clayey	1	Viking Upland
Uncas	Luvisolic	Dark Gray Luvisol	Till	Fine Loamy-Fine Clayey	2H	Beaverhill Upland

Soil group and map unit descriptions

Angus Ridge (AGS)

Angus Ridge is a thick, well-drained, black grassland soil (Eluviated Black) in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less than 5 percent coarse fragments, is 10 to 15 m thick and moderately calcareous. Angus Ridge is mapped on undulating and hummocky topography on the Daysland Plain.

A representative profile has a black, loamy surface horizon 15 to 30 cm thick underlain by an ashy, gray eluvial horizon and a brown, textural B horizon with prismatic structure in which clay has accumulated. The unaltered parent material is encountered at 70 to 90 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are slightly acid to slightly alkaline. Angus Ridge is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Angus Ridge is mapped with similar soils on sandy and silty glaciofluvial deposits, with soils having dark gray surface horizons and with imperfectly and poorly drained soils. Angus Ridge is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of associated wet soils.

AGPH 2

AGPH 2 is mapped on undulating morainal landscapes which are partially covered by a thin veneer of sandy glaciofluvial material. About 50 percent of the unit is Angus Ridge soil and 50 percent Peace Hills soil, but the proportions of each can vary somewhat between delineations. Imperfectly drained members of each group may occupy up to 15 percent of the landscape but do not affect any interpretations. Inclusions of silty (Ponoka) soils are occasionally present in AGPH 2 map units.

AGPH 3

AGPH 3 is mapped on undulating morainal landscapes which are partially covered by a thin veneer of sandy glaciofluvial material. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. About 40 percent of the unit is Angus Ridge soil, 40 percent Peace Hills and 20 percent poorly drained soils. The proportions of Angus Ridge and Peace Hills can be highly variable between delineations. Imperfectly drained members of each group occupy up to 15 percent of the landscape but do not affect any interpretations. Inclusions of silty (Ponoka) soils may be present in AGPH 3 map units.

AGPO 2

AGPO 2 is mapped on undulating morainal landscapes which are partially covered by a thin veneer of silty glaciofluvial material. The land surface is usually smooth and slopes are often simple and uniform. About 50 percent of the unit is Angus Ridge soil and 50 percent Ponoka soil, but the proportions of Angus Ridge and Ponoka soils can be quite variable between delineations. Imperfectly drained members of each group may occupy up to 15 percent of the landscape. Inclusions of sandy (Peace Hills) soils are often present in AGPO 2 map units.

AGS 2

AGS 2 is mapped on undulating and hummocky morainal landscapes. About 70 percent of the unit is Angus Ridge soil and 20 percent is a similar soil without the leached features. It may contain minor amounts (10 percent) of imperfectly and poorly drained soils, the pattern of which slightly impedes use for farming. Inclusions of sandy, silty and Solonetzic soils may be present, but do not affect the agricultural capability of the unit.

AGS 3

AGS 3 is mapped on undulating and hummocky morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. About 80 percent of the unit is Angus Ridge and similar well-drained soils, and 20 percent is poorly drained soils and pothole sloughs. Inclusions of sandy, silty and Solonetzic soils may occur, but do not affect the agricultural capability of the unit.

AGS 7

AGS 7 is mapped on gently rolling to hummocky morainal landscapes which are transitional between the Black soils of the Daysland Plain and the Gray soils of the Beaverhill Upland. This unit is composed mostly of Angus Ridge soil (70 percent) mixed with a significant component of Dark Gray and Gray soils (Uncas and Cooking Lake). Imperfectly drained soils of each group may occupy up to 15 percent of the landscape.

AGS 8

AGS 8 is mapped on gently rolling to hummocky morainal landscapes which are transitional between the Black soils of the Daysland Plain and the Gray soils of the Beaverhill Upland. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. About 60 percent of the unit is Angus Ridge soil, 20 percent Dark Gray and Gray soils (Uncas and Cooking Lake) and 20 percent poorly drained soils and pothole sloughs. Imperfectly drained members of each group may occupy up to 15 percent of the landscape.

Camp Lake (CPL)
Camp Lake is a thin, rapidly drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciofluvial parent material is sandy, contains 5 to 20 percent coarse fragments and is weakly calcareous. Camp Lake is mapped on undulating to inclined and terraced topography on the Viking Upland in association with the meltwater channel running from Camp Lake through Kinsella and Vernon Lake.

A representative profile has a thin, black, sandy surface horizon 10 to 15 cm thick underlain by a sandy, brown, structureless B horizon which grades to sandy parent material at 50 to 150 cm. Lime may or may not be encountered in the top 1 m. Till may be encountered at 0.7 to 1 m and is recognized by the presence of calcium carbonate, finer texture and characteristic pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are neutral to slightly acid. Camp Lake is highly pervious and has low moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Camp Lake is mapped with soils on coarser-textured glaciofluvial material. Camp Lake is suitable for limited grain and forage production, but the risk of crop failure is high. Most delineations are used for improved pasture with some in grain production. Limitations to crop production are a result of low available moisture-holding capacity.

CPL 2
CPL 2 is mapped on undulating glaciofluvial landscapes and on glaciofluvial terraces adjacent to meltwater channels and stream valleys. This unit is composed predominantly of Camp Lake soil, but up to 15 percent of the unit may be gravelly (Kinsella) soil which occurs in isolated pockets distributed randomly throughout the landscape.

Camrose (CMO)
Camrose is a deep, well-drained, black grassland soil (Black Solodized Solonetz) with a well developed subsurface hardpan (Bnt) horizon in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less that 5 percent coarse fragments, is 4 to 8 m thick, and is weakly calcareous and weakly saline. Camrose is mapped on undulating topography on the Daysland Plain.

A representative profile has a black, loamy surface horizon 15 to 30 cm thick underlain by a thin (2 to 5 cm), ashy gray eluvial horizon and a darkly stained, columnar, round-topped, Bnt horizon. The unaltered parent material is encountered at 60 to 90 cm and is recognized by the presence of calcium carbonate, gypsum crystals, pebbles, coal flecks and iron stains. The surface horizon is slightly acid to neutral and the subsurface horizons are slightly acid to moderately alkaline. The Bnt is a barrier to water and root penetration resulting in reduced moisture retention and increased risk of crop stress during drought. When wet, the Bnt becomes extremely soft and sticky and is slow to dry out resulting in reduced trafficability. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes, during heavy rainfall or when the surface horizon becomes saturated due to slow infiltration into the Bnt.

Camrose is mapped with similar soils in which the Bnt is less well developed or breaking down and with imperfectly and poorly drained soils. Camrose is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of the physical and chemical properties of the Bnt horizon and associated wet soils.

CMO 4
CMO 4 is mapped on undulating to gently rolling morainal landscapes. This unit is composed predominantly of Camrose soil, but thinner soils (Killam) and soils in which the subsurface hardpan is absent or beginning to break up may occupy up to 40 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

CMO 5
CMO 5 is mapped on undulating morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. This unit is composed predominantly of Camrose soil, but 20 percent of the landscape is occupied by poorly drained (Haight) soils. Thinner soils (Killam) and soils in which the subsurface hardpan is absent or beginning to break up may occupy up to 40 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

CMO 6
CMO 6 is mapped on undulating morainal landscapes. It is composed predominantly of Camrose soil, however, the brown till in which Camrose is formed is thin and discontinuous over gray till resulting in the presence of about 15 percent of the thinner and shallower Shonts soil. Thinner soils (Killam) and soils in which the subsurface hardpan is beginning to break up may occupy up to 40 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

CMO 7
CMO 7 is mapped on undulating morainal landscapes. Surface irregularities give rise to a pock-marked pattern of poorly drained depressions and pothole sloughs. This unit is composed predominantly of Camrose soil, but 20 percent of the landscape is occupied by poorly drained (Haight) soils. The brown till in which Camrose is formed is thin and discontinuous over gray till resulting in the presence of about 15 percent of the

thinner and shallower Shonts soil. Thinner soils (Killam) and soils in which the subsurface hardpan is beginning to break up may occupy up to 20 percent of a delineation. Imperfectly drained subgroups may occupy up to 15 percent of the unit.

Chatwin (CTW)
Chatwin is a deep, poorly drained peat soil (Typic Mesisol) in agroclimatic zone 2H. The organic parent material is moderately decomposed fen peat, 0.5 to 2 m thick. Chatwin is mapped on undulating depressions and hummocky topography on the Beaverhill Upland.

A representative profile has a 20 to 30 cm surface layer of undecomposed fibric sedge and moss underlain by a layer of moderately decomposed peat. The peat is composed of the remains of sedge and moss vegetation. Till is encountered at 0.7 to 2 m, is fine loamy, well gleyed and is recognized by the presence of calcium carbonate, pebbles and coal flecks. The surface horizon is strongly acid and the subsurface horizons are slightly to medium acid. Chatwin is poorly drained and has water at the soil surface throughout most of the year.

Chatwin is mapped with similar soils having layers of mineral material between 50 and 100 cm and with well and imperfectly drained upland soils. Chatwin is not suitable for grain or forage production. Limitations to crop production are a result of flooding, poor drainage and low natural fertility.

CTCO 1
CTCO 1 is mapped on undulating to hummocky morainal landscapes which are partially covered by a thin veneer of peaty organic material. About 60 percent of the unit is Chatwin soil and 40 percent Cooking Lake soil, but the proportions of each can vary somewhat between delineations. Chatwin occurs in depressional areas between hummocks on which Cooking Lake occurs. Imperfectly drained members of Cooking Lake are common.

CTW 1
CTW 1 is mapped on depressional organic landscapes and is composed predominantly of Chatwin soil. These delineations may be partially or entirely covered with water through some part of the year. The water table is generally found within the upper meter of the soil. Inclusions of wet soils on lacustrine, glaciofluvial or till materials occur around the perimeter of CTW 1 delineations.

Cooking Lake (COA)
Cooking Lake is a deep, well-drained, gray forest soil (Orthic Gray Luvisol) in agroclimatic zone 2H. The till parent material is fine loamy to fine clayey, generally contains 5 to 10 percent coarse fragments, is 10 to 30 m thick and is moderately calcareous. Inclusions of sandy or gravelly glaciofluvial material in the till are common. Cooking Lake is mapped on hummocky topography on the Beaverhill Upland.

A representative profile has a mat of poorly decomposed leaf litter 2 to 5 cm thick underlain by a well developed ashy gray eluvial horizon and a brown, prismatic B horizon in which clay has accumulated. The unaltered parent material is encountered at 80 to 150 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. When cultivated, the leaf litter and eluvial horizon are mixed in the plow layer. The surface horizon is moderately acid and the subsurface horizons are medium acid to neutral. Cooking Lake is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration but surface runoff will occur on slopes or during heavy rainfall.

Cooking Lake is mapped with similar soils on sandy glaciofluvial and clayey glaciolacustrine deposits, with Organic soils and with imperfectly and poorly drained soils. Cooking Lake is suitable for forage production, pasture and limited grain production. Current land use includes pasture and forage production, but most areas of Cooking Lake are not cultivated and remain under forest cover. Limitations to crop production are a result of climatic constraints, adverse soil structure and low natural fertility. Heavy rainfall on cultivated fields in spring can result in surface crusting and subsequent reduction in crop productivity.

COA 2
COA 2 is mapped on hummocky morainal landscapes. This unit is composed predominantly of Cooking Lake soil, but inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present. Imperfectly drained members of Cooking Lake soil and poorly drained soils may occupy up to 15 percent of a given delineation.

COA 4
COA 4 is mapped on undulating to slightly hummocky morainal landscapes. This unit is composed predominantly of Cooking Lake soil but also contains a significant amount (20 percent) of the Dark Gray Uncas soil. Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present in COA 4 map units.

COA 5
COA 5 is mapped on undulating to slightly hummocky morainal landscapes characterized by numerous poorly drained depressions which occur between the hummocks. About 50 percent of the unit is well-drained Cooking Lake soil, 20 percent Dark Gray soil (Uncas) and 20 percent poorly drained soils (peaty Gleysols and Chatwin). Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present in COA 5 map units.

COA 6
COA 6 is mapped on hummocky morainal landscapes. This unit is composed of Cooking Lake soil and 10 to 25 percent Organic soils (Chatwin and Terric Mesisols). Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present. Imperfectly drained members of each soil and poorly drained soils may occupy up to 15 percent of a given delineation.

COA 7
COA 7 is mapped on hummocky morainal landscapes. This unit is composed of Cooking Lake soil and 25 to 40 percent Organic soils (Chatwin and Terric Mesisols). Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present. Imperfectly drained members of each soil and poorly drained soils may occupy up to 15 percent of a given delineation.

COA6/W
COA6/W is mapped on slightly hummocky to hummocky morainal landscapes that have been subjected to limited glaciofluvial sorting. This unit is composed of Cooking Lake soil and a significant amount (20 percent) of a washed phase of Cooking Lake, which exhibits a variety of characteristics differentiating it from the modal profile. Most notably, the washed phase contains bands of sandy material interspersed with bands of clayey material in the B horizon. Occasionally a sandy veneer will be present. Imperfectly drained members of each soil and poorly drained soils may occupy up to 15 percent of a given delineation.

COA7/W
COA7/W is mapped on hummocky morainal landscapes that have been subjected to limited glaciofluvial sorting. This unit is composed of Cooking Lake, a significant amount (20 percent) of poorly drained soils (Chatwin and Terric Mesisols) and a significant (20 percent) amount of a washed phase of Cooking Lake, which exhibits a variety of characteristics differentiating it from the modal profile. Most notably, the washed phase contains bands of sandy material interspersed with bands of clayey material in the B horizon. Imperfectly drained members of each soil and poorly drained soils may occupy up to 15 percent of a given delineation.

COMY 2
COMY 2 is mapped on slightly hummocky morainal landscapes characterized by a thin and discontinuous veneer of clayey glaciolacustrine material overlying till. About 60 percent of the unit is Cooking Lake soil and 40 percent Maywood (Orthic Gray Luvisol on clayey glaciolacustrine) soil, but the proportions of each will vary somewhat between delineations. Imperfectly drained members of each soil group may occupy up to 15 percent of a given delineation.

COMY 3
COMY 3 is mapped on slightly hummocky morainal landscapes characterized by a thin and discontinuous veneer of clayey glaciolacustrine material overlying till. About 40 percent of the unit is Cooking Lake soil, 40 percent Maywood (Orthic Gray Luvisol on clayey glaciolacustrine) soil and 20 percent poorly drained soils (peaty Gleysols and Chatwin). Imperfectly drained members of each soil group may occupy up to 15 percent of a given delineation.

Daysland (DYD)
Daysland is a thin, well-drained, black grassland soil (Black Solod) with a moderately well developed subsurface hardpan (Bnt) horizon in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less that 5 percent coarse fragments, is 4 to 8 m thick, and is weakly calcareous and weakly saline. Daysland is mapped on undulating topography on the Daysland Plain and the Viking Upland.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a thin (2 to 5 cm), discontinuous ashy gray eluvial horizon and a darkly stained, columnar, Bnt horizon. The round-topped structure of the Bnt breaks into smaller blocky structural units. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate, gypsum crystals, pebbles, coal flecks and iron stains. The surface horizon is medium to strongly acid and the subsurface horizons are medium acid to moderately alkaline. The Bnt is a partial barrier to water and root penetration, resulting in reduced moisture retention and increased risk of crop stress during drought. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Daysland is mapped with similar soils in which the Bnt is well developed and with imperfectly and poorly drained soils. Daysland is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of the physical and chemical properties of the Bnt and associated wet soils.

DYD 4
DYD 4 is mapped on undulating to inclined morainal landscapes. This unit is composed of Daysland and a significant proportion (20 percent) of Killam soil in which the subsurface hardpan is intact. Imperfectly drained members of each soil and poorly drained soils may occupy up to 15 percent of a given delineation.

DYD 5
DYD 5 is mapped on slightly hummocky morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. This unit is composed of Daysland soil, 20 percent Killam soil in which the subsurface hardpan is intact and 20 percent poorly drained soils (Haight). Inclusions (10 percent) of Shonts soil on gray till or Heisler soil may be present but do not affect any interpretations.

Daugh (DUG)
Daugh is a thin, imperfectly drained, black grassland soil (Black Solonetz) with a well developed subsurface hardpan (Bnt) horizon in agroclimatic zone 1. The glaciolacustrine parent material is fine clayey, stone free, weakly calcareous and moderately saline. Daugh is mapped on level topography on the Daysland Plain.

A representative profile has a black, clayey surface horizon 2 to 10 cm thick underlain by a darkly stained, columnar, flat- or round-topped Bnt horizon. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate and gypsum crystals. The surface horizon is strongly acid and the subsurface horizons are medium acid to moderately alkaline. The Bnt is a barrier to water and root penetration resulting in reduced moisture retention and increased risk of crop stress during drought. When wet, the Bnt becomes extremely soft and sticky and is slow to dry out resulting in reduced trafficability. Rainfall enters the soil by infiltration but surface runoff or ponding will occur during moderate rainfall or when the surface horizon becomes saturated due to slow infiltration into the Bnt.

Daugh is mapped with imperfectly and poorly drained soils. Daugh is suitable for forage production and pasture. Limitations to crop production are a result of the physical and chemical properties of the Bnt and associated wet soils.

DUG 1
DUG 1 is mapped on level glaciolacustrine landscapes. This unit is composed predominantly of Daugh soil. Inclusions of saline soils and poorly drained soils (Haight) may occupy up to 10 percent of a given delineation.

Elnora (EOR)
Elnora is a thin, well-drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less than 5 percent coarse fragments, is 8 to 30 m thick and is moderately calcareous. Lenses of sand and gravel are common in the the till. Elnora is mapped on undulating and hummocky topography on the Viking Upland.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a yellowish brown, weakly to moderately prismatic B horizon. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid to neutral and the subsurface horizons are neutral to mildly alkaline. Elnora is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Elnora is mapped with similar soils having greater accumulation of topsoil, with similar soils on sandy glaciofluvial material, with soils having columnar round-topped Bnt horizons, and with imperfectly and poorly drained soils. Elnora is suitable for grain and forage production. Current land use includes grain and forage production. Steeply sloping areas are used for grazing and improved pasture. The potential for water erosion on steeply sloping land is high. Limitations to crop production are a result of steep slopes and associated sloughs and wet soils.

EOIR 2
EOIR 2 is mapped on slightly hummocky morainal landscapes characterized by a thin discontinuous veneer of sandy glaciofluvial material over till. About 60 percent of the unit is Elnora soil and 40 percent Irma soil, but the proportions of each can vary somewhat between delineations. Imperfectly drained soils of each group may occupy up to 15 percent of the landscape. Inclusions (10 percent) of Solonetzic soils (Killam, Shonts) and gravelly soils (Kinsella) may be present in the EOIR 2 map units.

EOR 1
EOR 1 is mapped on undulating to hummocky morainal landscapes. It is composed predominantly of Elnora soil found in the mid and upper slope positions. A soil with an accumulation of topsoil greater than that which is characteristic for Elnora is found in the lower slope positions and occupies about 20 percent of the unit. EOR 1 is a relatively pure unit and does not contain wet soils or strongly contrasting soils.

EOR 2
EOR 2 is mapped on undulating to hummocky morainal landscapes. It is composed predominantly of Elnora soil found in the mid and upper slope positions. A soil with an accumulation of topsoil greater than that which is characteristic for Elnora is found in the lower slope positions and occupies about 20 percent of the unit. Imperfectly and poorly drained soils occupy less than 15 percent of the landscape. Inclusions of Solonetzic soils (Killam, Shonts), sandy soils (Irma, Camp Lake)

and gravelly soils (Kinsella) may be present in the EOR 2 map units.

EOR 3
EOR 3 is mapped on undulating to hummocky morainal landscapes characterized by numerous poorly drained depressions which occur between the hummocks. It is composed predominantly of Elnora soil found in the mid and upper slope positions. A soil with an accumulation of topsoil greater than that which is characteristic for Elnora is found in the lower slope positions and occupies about 20 percent of the unit. Poorly drained soils and pothole sloughs occupy about 20 percent of the unit. Inclusions of Solonetzic soils (Killam, Shonts), sandy soils (Irma, Camp Lake) and gravelly soils (Kinsella) may be present in EOR 3 map units.

EOR 4
EOR 4 is mapped on undulating to slightly hummocky morainal landscapes. This unit is composed predominantly of Elnora, but about 20 percent of the landscape is occupied by Solonetzic soils (Killam and Daysland) formed on brown till. Inclusions of sandy soils (Irma, Camp Lake) and Solonetzic soils on gray till (Shonts) may be present in EOR 4 map units.

EOR 5
EOR 5 is mapped on undulating to hummocky morainal landscapes characterized by numerous poorly drained depressions which occur between the hummocks. This unit is composed predominantly of Elnora, 20 percent Solonetzic soils (Killam and Shonts) and 20 percent poorly drained (Haight) soils and pothole sloughs. Inclusions of sandy soils (Irma, Camp Lake) and Solonetzic soils on gray till (Shonts) may be present in EOR 5 map units.

EOR 10
EOR 10 is mapped on hummocky morainal landscapes that have been eroded to the point that the tops of the hummocks are no longer covered with topsoil. This unit is composed predominantly of Elnora soil found in the mid slope position. A soil with an accumulation of topsoil greater than that which is characteristic for Elnora is found in the lower slope positions and occupies about 20 percent of the unit. Erosion has resulted in the exposure of the brown B horizon and in some cases, of the calcareous parent material on the crests of the hummocks. Inclusions (10 percent) of Solonetzic soils (Killam and Daysland), sandy (Irma, Camp Lake) soils and Solonetzic soils on gray till (Shonts) may be present in EOR 10 map units.

Gadsby (GBY)
Gadsby is a thin, well-drained, black grassland soil (Black Solodized Solonetz) with a well developed subsurface hardpan (Bnt) horizon material in agroclimatic zone 1. The glaciolacustrine parent material is fine silty, stone free, is 1 to 4 m thick, weakly calcareous and weakly saline. Gadsby is mapped on level to undulating topography on the Daysland Plain.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a thin (2 to 5 cm), discontinuous ashy gray eluvial horizon and a darkly stained, columnar, round-topped Bnt horizon. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate and gypsum crystals. The surface horizon is slightly acid and the subsurface horizons are strongly acid to mildly alkaline. The Bnt is a barrier to water and root penetration resulting in reduced moisture retention and increased risk of crop stress during drought. When wet, the Bnt becomes extremely soft and sticky and is slow to dry out resulting in reduced trafficability. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes, during heavy rainfall or when the surface horizon becomes saturated due to slow infiltration into the Bnt.

Gadsby is mapped with similar soils in which the upper Bnt is less well developed or breaking down and with imperfectly and poorly drained soils. Gadsby is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of the physical and chemical properties of the Bnt and associated wet soils.

GBY 2
GBY 2 is mapped on level to gently undulating glaciolacustrine landscapes. This unit is composed predominantly of Gadsby and about 15 to 30 percent of the soils may be imperfectly drained. Inclusions of Solonetzic soils on till (Killam, Daysland) and poorly drained (Haight) soils may be present in GBY 2 map units.

Heisler (HER)
Heisler is a thin, well-drained, black grassland soil (Solonetzic Black) with a weakly developed subsurface hardpan (Bnt) horizon in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less that 5 percent coarse fragments, is 4 to 8 m thick, and is weakly calcareous. Heisler is mapped on undulating and hummocky topography on the Daysland Plain and the Viking Upland.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a thin (2 to 5 cm), discontinuous ashy gray eluvial horizon and a brown, weakly stained, prismatic, B horizon. The B Horizon has some of the columnar features and staining of the solonetzic B horizon but lacks the sodium content of the Bnt. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are neutral to slightly

alkaline. Heisler is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Heisler is mapped with similar soils in which the Bnt is well developed and with imperfectly and poorly drained soils. Heisler is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of the physical and chemical properties of the Bnt and associated wet soils.

HEIM 4
HEIM 4 is mapped on undulating morainal landscapes partially covered by a veneer of sandy glaciofluvial material. About 60 percent of the unit is well-drained Heisler and 40 percent is rapidly drained Irma soil, but the proportions of each can vary somewhat between delineations. Imperfectly drained soils of each group may occupy up to 15 percent of the landscape. Inclusions (10 percent) of Solonetzic soils (Killam, Shonts) and gravelly soils (Kinsella) may be present in HEIM 4 map units.

HER 2
HER 2 is mapped on undulating morainal landscapes. This unit is composed predominantly of Heisler and 15 percent of the soils may be imperfectly drained. Inclusions of Solonetzic (Killam, Daysland, Shonts), poorly drained (Haight) and sandy (Irma) soils may be present in HER 2 map units.

HER 3
HER 3 is mapped on undulating morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. About 80 percent of the unit is well-drained Heisler and similar soils and 20 percent is poorly drained Haight soil and pothole sloughs. Imperfectly drained soils are common. Inclusions of Solonetzic (Killam, Daysland, Shonts) and sandy (Irma) soils may be present in HER 2 map units.

HER 4
HER 4 is mapped on undulating to hummocky morainal landscapes. About 60 percent of this unit is well-drained Heisler soil and 40 percent Solonetzic soils (Killam, Daysland). Imperfectly drained members of each group occupy up to 15 percent of the unit.

HER 5
HER 5 is mapped on undulating morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. About 60 percent of the unit is Heisler and similar soils, 20 percent Solonetzic soils (Killam and Daysland) and 20 percent poorly drained Haight soil. Inclusions of sandy Irma soils may be present in HER 5 map units.

Haight (HGT)
Haight is a thick, poorly drained, black grassland soil (Orthic Humic Gleysol) in agroclimatic zone 1. The lacustrine parent material is fine clayey, stone free, 0.5 to 1.5 m thick and weakly calcareous. Haight is mapped on level depressional topography on the Daysland Plain, the Viking Upland and the Torlea Flats.

A representative profile has a black, fine silty to fine clayey surface horizon 20 to 60 cm thick underlain by a gray to dark gray structureless (massive) B horizon with reddish mottles, which grades to dark gray till with reddish mottles between 0.7 and 1 m. The surface horizon is neutral and the subsurface horizons are neutral to slightly alkaline. Surface runoff and material eroded from surrounding areas accumulates in these depressional positions. Water is retained due to slow infiltration.

Haight is mapped with saline soils which occur around the perimeter of the depressions and with imperfectly and well-drained upland soils in areas where the two cannot be mapped separately. Haight is suitable for forage production if drained. Most delineations are used for pasture and as a water source for cattle. Limitations to crop production are a result of permanent wetness and associated salinity.

HGT 1
HGT 1 is mapped on depressional glaciolacustrine landscapes. This unit is composed predominantly of Haight soil. Inclusions of imperfectly drained upland soils (Killam, Daysland, Shonts, Heisler, Angus Ridge, Camrose, Norma) may be present in HGT 1 map units. Water may cover the soil surface in these areas for some part of the year.

HGT 2
HGT 2 is mapped on undulating morainal landscapes which are partially covered with a veneer of glaciolacustrine material. This unit is composed predominantly of Haight and a significant proportion of imperfectly to well drained upland soils (Killam, Daysland, Shonts, Heisler, Angus Ridge, Camrose, Norma).

HGT 3
HGT 3 is mapped in sinuous meltwater channels cut into the till. The channels tend to be shallow with gently sloping sides but can be several meters deep with steeply sloping sides. Channel bottoms are dominantly Haight and the sides are composed of a mixture of upland soils (Killam, Camrose, Heisler, Angus Ridge, Norma) and bedrock exposures. If the gray till is exposed, Shonts soil will be present.

Irma (IRM)
Irma is a thin, well to rapidly drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciofluvial parent material is sandy, may contain pebbles, is 1 to 5 m thick and weakly calcareous. Irma is mapped on undulating and hummocky topography on the Daysland Plain and the Viking Upland.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a sandy, yellowish brown, structureless B horizon which grades to sandy parent material. Lime may or may not be encountered in the top 1 m. Till may be encountered at 0.7 to 1 m and is recognized by the presence of calcium carbonate, finer texture and characteristic pebbles, coal flecks and iron stains. The surface horizon is medium acid and the subsurface horizons are slightly acid to neutral. Irma is highly pervious and has low moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Irma is mapped with similar soils on till and with imperfectly and poorly drained soils. Irma is suitable for limited grain and forage production and the risk of crop failure is high. Most delineations are used for improved pasture with some in grain production. Limitations to crop production are a result of low available moisture-holding capacity.

IRM 2
IRM 2 is mapped on undulating glaciofluvial landscapes and is composed predominantly of Irma soil. Imperfectly drained Irma may occupy up to 15 percent of the unit. Inclusions (10 percent) of till soils or poorly drained soils may be present in IRM 2 map units.

Killam (KLM)
Killam is a thin, well-drained, black grassland soil with a well developed subsurface hardpan (Bnt) horizon (Black Solodized Solonetz) in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less than 5 percent coarse fragments, is 4 to 8 m thick, and is weakly calcareous and weakly saline. Killam is mapped on undulating topography on the Daysland Plain and the Viking Upland.

A representative profile has a black, loamy surface horizon 10 to 15 cm thick underlain by a thin (2 to 5 cm), discontinuous ashy gray eluvial horizon and a brown, darkly stained, columnar, round-topped, Bnt horizon. The unaltered parent material is encountered at 40 to 60 cm and is recognized by the presence of calcium carbonate, gypsum crystals, pebbles, coal flecks and iron stains. The surface horizon is medium to slightly acid and the subsurface horizons are slightly acid to moderately alkaline. The Bnt is a barrier to water and root penetration, resulting in reduced moisture retention and increased risk of crop stress during drought. When wet, the Bnt becomes extremely soft and sticky and is slow to dry out resulting in reduced trafficability. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes, during heavy rainfall or when the surface horizon becomes saturated due to slow infiltration into the Bnt.

Killam is mapped with similar soils in which the upper Bnt is less well developed or breaking down and with imperfectly and poorly drained soils. Killam is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of the physical and chemical properties of the Bnt and associated wet soils.

KLM 4
KLM 4 is mapped on undulating to gently rolling morainal landscapes. This unit is composed predominantly of Killam soil, but thicker soils (Camrose) and soils in which the subsurface hardpan is beginning to break up may occupy up to 40 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

KLM 5
KLM 5 is mapped on undulating morainal landscapes. Surface irregularities result in a pock-marked pattern of poorly drained depressions and pothole sloughs. This unit is composed predominantly of Killam soil, but 20 percent of the landscape is occupied by poorly drained Haight soils. Thicker Camrose soils and soils in which the subsurface hardpan is beginning to break up may occupy up to 40 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

KLM 6
KLM 6 is mapped on undulating morainal landscapes. It is composed predominantly of Killam soil, but the brown till in which Killam is formed is thin and discontinuous over gray till, resulting in the presence of about 15 percent of the thinner and shallower Shonts soil. Soils in which the subsurface hardpan is beginning to break up may occupy up to 20 percent of a delineation. Imperfectly drained members of each group may occupy up to 15 percent of the unit.

KLM 7
KLM 7 is mapped on undulating morainal landscapes. Surface irregularities give rise to a pock-marked pattern of poorly drained depressions and pothole sloughs. This unit is composed predominantly of Killam soil, but 20 percent of the landscape is occupied by poorly drained Haight soils. The brown till in which Killam is formed is thin and discontinuous over gray till resulting in the presence of about 15 percent of the thinner and shallower Shonts soil. Soils in which the subsurface hardpan is beginning to break up may occupy up to 20 percent of a delineation. Imperfectly drained subgroups may occupy up to 15 percent of the unit.

Kinsella (KNA)
Kinsella is a thin, rapidly drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciofluvial parent material is gravelly, 1 to 5 m thick and weakly calcareous. Kinsella is mapped on undulating to inclined and terraced topography on the Viking Upland in association with the meltwater channel running from Camp Lake through Kinsella and Vernon Lake.

A representative profile has a black, gravelly and sandy surface horizon 10 to 15 cm thick underlain by gravel. Lime may be encountered at 50 to 100 cm in the gravel. Kinsella is highly pervious and has low moisture retention. Most rainfall enters the soil by infiltration.

Kinsella is mapped with similar soils on finer textured glaciofluvial material. Kinsella has severe limitations that restrict its capability to produce grain and forage crops. Most delineations are used for grazing cattle or as gravel pits. Limitations to crop production are a result of low moisture-holding capacity and excessive surface stoniness.

KNA 1
KNA 1 is mapped on glaciofluvial terraces along major meltwater channels. This unit is composed predominantly of Kinsella soil. A thin discontinuous veneer of sandy glaciofluvial material results in the presence of 20 percent Camp Lake soil. Inclusions of imperfectly or poorly drained soils may be present in KNA 1 map units.

Leith (LTH)
Leith is a deep, well-drained, dark gray forest soil (Dark Gray Luvisol) in agroclimatic zone 2H. The glaciofluvial parent material is coarse loamy, generally contains less than 5 percent coarse fragments, is 1 to 5 m thick and weakly calcareous. Leith is mapped on hummocky topography on the Beaverhill Upland.

A representative profile has a dark gray, loamy surface horizon 10 to 15 cm thick (when cultivated) underlain by an ashy gray, platy eluvial horizon and a brown, weakly prismatic, textural B horizon which grades to sandy unaltered parent material. Till may be encountered within 1 m and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are slightly acid to moderately alkaline. Leith is highly pervious and has low moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Leith is mapped with similar soils on till and with imperfectly drained soils. Leith is suitable for forage production, grazing and limited grain production. Most delineations are cultivated and seeded to improve pasture. Limitations to crop production are a result of low moisture-holding capacity and low natural fertility.

LTUN 2
LTUN 2 is mapped on slightly hummocky morainal landscapes characterized by a thin, discontinuous veneer of sandy glaciofluvial material. About 60 percent of the unit is Leith soil and 40 percent is Uncas soil, however, the proportion of each may vary somewhat between delineations. Imperfectly drained members of each group may occupy up to 15 percent of a given delineation.

Macola (MCO)
Macola is a deep, moderately well to well drained, dark gray forest soil (Dark Gray Luvisol) in agroclimatic zone 2H. The glaciolacustrine parent material is fine clayey, stone free, 1 to 3 m thick and weakly calcareous. Macola is mapped on undulating topography on the Beaverhill Upland.

A representative profile has a dark gray, fine loamy surface horizon 10 to 15 cm thick (when cultivated) underlain by an ashy gray, platy eluvial horizon and a brown, prismatic, textural B horizon which grades to clayey unaltered parent material. Till may be encountered within 1 m and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are slightly acid to moderately alkaline. Macola is moderately impervious and has good moisture retention.

Macola is mapped with similar soils on glaciolacustrine material and with imperfectly and poorly drained soils. Macola is suitable for forage production, grazing and limited grain production. Current land use includes grain and forage production, most Macola areas are cultivated. Limitations to crop production are a result of climatic constraints, adverse soil structure and low natural fertility.

MCMW 2
MCMW 2 is mapped on undulating morainal landscapes characterized by a thin and discontinuous veneer of clayey glaciolacustrine material. About 60 percent of the unit is Macola soil and 40 percent Maywood (Orthic Gray Luvisol on clayey glaciolacustrine) soil, but the proportions of each will vary somewhat between delineations. Imperfectly drained members of each soil group may occupy up to 15 percent of a given delineation.

MCMW 3
MCMW 3 is mapped on slightly hummocky morainal landscapes characterized by a thin and discontinuous veneer of clayey, glaciolacustrine material. Surface irregularities result in a pock-marked pattern of poorly drained depressions. About 40 percent of the unit is Macola soil, 40 percent Maywood (Orthic Gray Luvisol on clayey glaciolacustrine) soil and 20 percent poorly drained soils. Imperfectly drained members of each soil group may occupy up to 15 percent of a given

delineation. Inclusions of Orthic Gray Luvisolic soils (Cooking Lake) may be present in MCMW 2 map units.

Norma (NRM)
Norma is a deep, well-drained, black grassland soil (Solonetzic Black) in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less than 5 percent coarse fragments, is 10 to 15 m thick and moderately calcareous. Norma is mapped on undulating topography on the Daysland Plain.

A representative profile has a black loamy surface horizon 15 to 20 cm thick underlain by a discontinuous ashy gray, platy, eluvial horizon and a brown, textural B horizon in which clay has accumulated. The B Horizon has some of the columnar features and staining of the Solonetzic B horizon but lacks the sodium content of the Bnt. The unaltered parent material is encountered at 70 to 90 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are slightly acid to moderately alkaline. Norma is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Norma is mapped with similar soils without solonetzic properties, with Solonetzic soils and with wet and imperfectly drained soils. Norma is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of associated Solonetzic and imperfectly and poorly drained soils.

NRM 4
NRM 4 is mapped on undulating to slightly hummocky morainal landscapes. About 60 percent of the unit is Norma soil and 40 percent is well drained Solontezic soils (Camrose, Killam, Daysland). Imperfectly drained members of each group occupy 15 percent of the landscape. Inclusions of Angus Ridge, Shonts, Peace Hills or Ponoka soils may be present in NRM 4 map units.

NRM 5
NRM 5 is mapped on undulating to slightly hummocky landscapes. It is composed predominantly of Norma but also contains a significant proportion (20 percent) of Solonetzic soils (Camrose, Black Solods) and 20 percent poorly drained soils (Haight). Inclusions of Killam or Shonts soils may be present in NRM 5 map units.

Peace Hills (PHS)
Peace Hills is a deep, well-drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciofluvial parent material is coarse loamy, generally stone free, 1 to 5 m thick over till and weakly calcareous. Peace Hills is mapped on undulating, hummocky topography on the Daysland Plain.

A representative profile has a black, sandy to loamy surface horizon 15 to 20 cm thick underlain by a yellowish brown, weakly structured, B horizon which grades to sandy parent material at 70 to 90 cm. Till may be encountered at 90 to 100 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is slightly acid and the subsurface horizons are neutral to mildly alkaline. Peace Hills is highly pervious and has low moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Peace Hills is mapped with similar soils on finer textured glaciofluvial material and till and with imperfectly and poorly drained soils. Peace Hills is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of low moisture-holding capacity and associated wet soils.

PHS 2
PHS 2 is mapped on undulating glaciofluvial landscapes. This unit is characterized by a continuous veneer of sandy glaciofluvial material over till. Peace Hills is the dominant soil group, but inclusions of till soils (Angus Ridge), silty soils (Ponoka) and imperfectly drained soils may be present.

Ponoka (POK)
Ponoka is a deep, well-drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciofluvial parent material is fine loamy, generally stone free, is 1 to 5 m thick and moderately calcareous. Ponoka is mapped on undulating topography on the Daysland Plain.

A representative profile has a black, loamy, surface horizon 15 to 20 cm thick underlain by a thin, discontinuous, ashy gray, eluvial horizon and a brown, weakly prismatic, B horizon, in which clay has accumulated. The B horizon grades to silty parent material which contains lime. Till may be encountered at 70 to 100 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is medium acid and the subsurface horizons are medium acid to mildly alkaline. Ponoka is moderately pervious and has moderate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Ponoka is mapped with similar soils on coarser glaciofluvial material and till and with imperfectly drained soils. Ponoka is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of associated imperfectly and poorly drained soils.

POK 2
POK 2 is mapped on undulating glaciofluvial landscapes. This unit is characterized by a continuous veneer of silty glaciofluvial material over till. Ponoka is the dominant soil, but inclusions of till soils (Angus Ridge), sandy soils (Peace Hills), and imperfectly drained soils may be present in POK 2 map units.

Shonts (SHS)
Shonts is a thin and shallow, moderately well drained, black grassland soil (Black Solodized Solonetz) in agroclimatic zone 1. The till parent material is fine loamy to fine clayey, generally contains less than 5 percent coarse fragments, is 0.3 to 2 m thick, moderately calcareous, moderately saline and contains a high percentage of bedrock. Shonts is mapped on undulating topography on the Torlea Flats and to a lesser extent on the Daysland Plain.

A representative profile has a black, loamy, surface horizon 2 to 10 cm thick underlain by an ashy gray, platy, eluvial horizon and a dark yellowish brown, darkly stained, columnar, round-topped, Bnt horizon. The unaltered parent material is encountered at 20 to 60 cm and is recognized by the presence of calcium carbonate and gypsum, pebbles, coal flecks, iron stone and shale and bedrock material. The surface horizon is strongly acid and the subsurface horizons are neutral to moderately alkaline. The Bnt is a barrier to water and root penetration, resulting in reduced moisture retention and increased risk of crop stress during drought. When wet, the Bnt becomes extremely soft and sticky and is slow to dry out, resulting in reduced trafficability. Rainfall enters the soil by infiltration but surface runoff will occur once the thin layer of topsoil becomes saturated.

Shonts is mapped with similar soils in which the upper Bnt is less well developed or breaking down and with imperfectly and poorly drained soils. Shonts is suitable for grazing and limited forage production. Most delineations are in pasture and many are not cleared of trees. Limitations to crop production are a result of the adverse physical and chemical properties of the Bnt and the lack of topsoil.

SHS 4
SHS 4 is mapped on level to undulating morainal landscapes characterized by a thin continuous veneer of gray till over bedrock. About 80 percent of the unit is Shonts soil and 20 percent is made up of soils in which the subsurface hardpan is breaking up. Inclusions of Killam, Haight, Ponoka and Peace Hills soils may be present in SHS 4 map units. Imperfectly drained members may occupy up to 15 percent of the landscape.

SHS 5
SHS 5 is mapped on level to undulating morainal landscapes characterized by a thin continuous veneer of gray till over bedrock. Surface irregularities result in a pock-marked pattern of poorly drained depressions. About 60 percent of the unit is Shonts soil, 20 percent is poorly drained Haight soil and the remaining 20 percent is made up of soils in which the subsurface hardpan is breaking down. Inclusions of Killam, Haight, Ponoka and Peace Hills soils may be present in SHS 5 map units.

Thomas Lake (TOA)
Thomas Lake is a thin, moderately well-drained, black grassland soil (Orthic Black) in agroclimatic zone 1. The glaciolacustrine parent material is fine clayey, stone free, is 0.5 to 2 m thick and moderately calcareous. Thomas Lake is mapped on level to undulating topography on the Viking Upland.

A representative profile has a black, clayey, surface horizon 10 to 15 cm thick underlain by a clayey, very dark grayish brown, prismatic, B horizon grading into unaltered parent material at 50 to 100 cm which contains lime. Till may be encountered at 70 to 100 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. The surface horizon is medium acid and the subsurface horizons are slightly acid to mildly alkaline. Thomas Lake is slightly impervious and has good moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rain- fall.

Thomas Lake is mapped with similar soils on till and with imperfectly and poorly drained soils. Thomas Lake is suitable for grain and forage production and most delineations are cultivated. Limitations to crop production are a result of associated imperfectly and poorly drained soils.

TOA 4
TOA 4 is mapped on level to gently undulating glaciolacustrine landscapes characterized by a continuous veneer of clayey material over till. Thomas Lake is the dominant soil, but inclusions of till soils (Elnora, Killam, Heisler), or poorly drained soils may be present in TOA 4 map units. Imperfectly drained soils may occupy up to 15 percent of the landscape.

TOA 5
TOA 5 is mapped on level to gently undulating glaciolacustrine landscapes characterized by a continuous veneer of clayey material over till. Surface irregularities result in a pock-marked pattern of poorly drained depressions. Thomas Lake is the dominant soil, but poorly drained soils occupy 20 percent of the landscape. Imperfectly drained soils may occupy up to 15 percent of a given delineation. Inclusions of till (Elnora) and Solonetzic (Killam) soils may be present in TOA 5 map units.

Uncas (UCS)
Uncas is a deep, well-drained, dark gray, forest soil (Dark Gray Luvisol) in agroclimatic zone 2H. The till parent material is fine loamy to fine clayey, generally contains 5 to 10 percent coarse fragments, is 10 to 30 m thick and is moderately calcareous. Inclusions of sandy or gravelly glaciofluvial material in the till are common. Uncas is mapped on hummocky topography on the Beaverhill Upland.

A representative profile has a mat of poorly decomposed leaf litter 2 to 5 cm thick underlain by a gray, eluvial horizon and a brown, textural, B horizon with strong, prismatic structure in which clay has accumulated. The unaltered parent material is encountered at 80 to 150 cm and is recognized by the presence of calcium carbonate, pebbles, coal flecks and iron stains. When cultivated, the leaf litter and eluvial horizon are mixed in the plow layer. The surface horizon is moderately acid and the subsurface horizons are medium acid to neutral. Uncas is moderately pervious and has adequate moisture retention. Most rainfall enters the soil by infiltration, but surface runoff will occur on slopes or during heavy rainfall.

Uncas is mapped with similar soils on sandy glaciofluvial and clayey glaciolacustrine deposits, with organic soils and with imperfectly and poorly drained soils. Uncas is suitable for forage production, pasture and limited grain production. Current land use includes pasture and forage production, but most areas of Uncas are not cultivated and remain under forest cover. Limitations to crop production are a result of climatic constraints, adverse soil structure and low natural fertility. Heavy rainfall on cultivated fields in spring can result in surface crusting and a subsequent reduction in productivity.

UCS 5
UCS 5 is mapped on undulating to hummocky morainal landscapes. Uncas is the dominant soil and Cooking Lake is the subdominant soil occupying about 20 percent of the unit. Generally, Uncas is found in areas where cultivation has been responsible for the mixing of the upper 15 cm, resulting in dark gray surface colors. Cooking Lake soils are generally found under tree cover where mixing has not occurred. Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present in UCS 5 map units.

UCS 6
UCS 6 is mapped on hummocky morainal landscapes characterized by numerous, poorly drained depressions and pothole sloughs. Uncas is the dominant soil, but 20 percent is Cooking Lake and 20 percent poorly drained soils. Generally, Uncas is found in areas where cultivation has been responsible for the mixing of the upper 15 cm of the soil, resulting in dark gray surface colors. Cooking Lake soil is generally found under tree cover where mixing has not occurred. Inclusions (10 percent) of sandy glaciofluvial or clayey glaciolacustrine soils may be present in UCS 6 map units.

Miscellaneous land types

Alluvium (Av)
Alluvium is composed of recent deposits of sand, silt, clay and organic matter over bedrock in stream valleys. Soil profile development is weak or nonexistent. Wetness, flooding and the lack of topsoil make these areas unsuitable for improved pasture or forage production, but they do provide water and limited grazing for cattle.

Beach Sand
Beach Sand units are mapped in the Beaverhill Lake and Birch Lake basins. They are composed of sorted beach sand on which little soil development has occurred. The predominant soil forming processes are leaching and gleying. Lack of topsoil, low moisture-holding capacity and flooding make these areas unsuitable for improved pasture or forage production, but they do provide limited grazing for cattle.

BS 1
BS 1 units are mapped on the forebeach of the lake basin on gently sloping topography. They are subject to frequent flooding and are wet throughout much of the year. Salinity is also prevalent in these units.

BS 2
BS 2 units are mapped on the back beach of the lake basin on nearly level topography. They are better drained and less susceptible to flooding than the BS 1 units, but the soils are somewhat gleyed, suggesting a high water table.

BS2D2
BS2D2 units are also mapped on the back beach of the lake basin on slightly hummocky topography. They have been eroded, apparently by wind, resulting in the presence of blow-out pits devoid of vegetative cover.

Coal Mine (CM)
Areas mapped as CM are disturbed lands resulting from the process of surface coal mining. Some areas have been reclaimed, but the majority have not. Surface expression is a function of mining, current land use or reclamation procedure.

Gravel Pit (GP)
Areas mapped as GP are disturbed lands resulting from the process of gravel removal. These areas generally have not been reclaimed. Surface expression is a function of the mining process.

Lake Basin (LB)
Areas mapped as Lake Basin are generally on the perimeter of a large lake and are transitional between lake bottom sediments and upland soils. Soils of Lake Basin units are imperfectly to poorly drained and weakly developed. The lacustrine parent material is silty to clayey with varying amounts of undecomposed organic matter in the upper profile. Considerable variability exists in the material and soil composition of these delineations. Limitations to agriculture are a result of poor drainage and inundation from lakes or streams.

LB 4
LB 4 units are composed of a variety of soils all reflecting recent depositional environments. Considerable variability may exist between delineations of this map unit because of differences in depositional environments and processes.

Rough Broken Land (RB)
Rough Broken lands are undifferentiated steeply sloping land units that form the banks to stream channels and spillways. Considerable variability exists in the soil and material composition af these units. Steepness of slope is the major limitation to agriculture. Two units have been recognized on the basis of landform and the presence of exposed bedrock.

RB 1
RB 1 is mapped on steep slopes covered by a thin and discontinuous veneer of till. Bedrock is often exposed on these slopes or is very close to the soil surface. These units are composed of Black grassland soils with varying amounts of topsoil. The thickness of topsoil is a function of slope position: soils in the upper slope position tend to be thinner than those in the lower slope positions. The differences in topsoil thickness is thought to be a function of erosion. Limitations to agriculture are a result of the steepness of slope.

RB 3
RB 3 is mapped in narrow valleys where it is not possible to separate the valley walls from the valley bottom. Bedrock is occasionally exposed and is thought to be within 2 m of the soil surface. The valley walls are occupied by well-drained black grassland soils and the valley bottoms are composed of a variety of poorly drained, weakly developed and often saline soils. Limitations to agriculture are a result of steepness of slope, poor drainage in the valley bottom and flooding of the valley bottom.

Part 3. Interpretation of soils of the County of Beaver

In this section, the soils described in the preceeding chapter (Part 2) are interpreted for the various potential uses considered relevant to the purposes of the survey. Each of the soil units recognized and mapped in this area differs in some way from the other units. All of the units, to a varying degree, have different management requirements, use capabilities, and yield potential. However, many soil units have certain similarities which allow them to be grouped together when estimating their suitabilities or limitations for particular uses.

These groupings are based upon evaluations of data accumulated during the soil survey and upon related applied research and experience. All interpretations are derived from soil ratings based on the properties and characteristics of the soil units. Some of the more commonly used criteria are slope, drainage, perviousness, texture, pedological classification, stoniness and depth to bedrock.

The data collected during the soil survey are of value for making other interpretations that were not deemed relevant at the time of writing based on current land use. These interpretations include ratings for non-agricultural uses such as road location, urban services, septic fields, sanitary landfills, permanent buildings, source of topsoil, source of gravel and source of road fill.

Soil unit interpretations are intended only to serve as guides for planners and managers. They are not intended as recommendations for land use and do not eliminate the need for on-site evaluations by qualified professionals.

Soil capability classification for dryland agriculture

In this classification, mineral soils are grouped into seven classes on the basis of their limitations for dryland farming. The first three classes are considered capable of sustained production of common field crops, the fourth class is marginal for sustained arable agriculture, the fifth class is capable of use only for improved permanent pasture, the sixth class is capable of use only for wild pasture, while the seventh class is for soils and land types considered not capable of use for arable agriculture or permanent pasture. While the soils in classes one to four are capable of use for cultivated field crops, they are also capable for use as permanent pasture. Soils in all classes may be suitable for forestry, wildlife and recreational uses. Soils in classes four to seven are not necessarily non-productive. They are simply restricted in the range of crops which they can support or present management problems which make them difficult or expensive to use.

Basic assumptions of classification system

This soil capability classification contains the following assumptions:

1. It is an interpretive classification based on the effects of combinations of climate and soil characteristics and their general productive capacity for common field crops.
2. Soils will be well managed and cropped, using a largely mechanized system of agriculture.
3. Soils within a capability class are similar with respect to degree but not kind of limitation. Each class includes many different kinds of soils and many soils within one class require unlike management.
4. Soils considered feasible for improvement by practices that can be made economically by the farmer himself are classified according to their limitations after the improvements are made. Soils requiring improvements beyond the means of the individual operator are classified according to their present condition.
5. Distance to market, kind of roads, location, size of farms, characteristics of land ownership, cultural patterns and the skill or resources of individual operators are not criteria for capability groupings.

Capability groupings are subject to change as new information about the behavior and responses of the soils becomes available.

Structural organization of classification system

The capability classification consists of two main categories, the capability class and the capability subclass.

The capability class, the broadest category, is a grouping of soils that have the same relative degree of limitation or hazard for agricultural use. The limitation becomes progressively greater from Class 1 to Class 7. The seven capability classes are:

Class 1 – Soils in this class have no significant limitations in use for crops.

Class 2 – Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3 – Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4 – Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.

Class 5 – Soils in this class have very severe limitations that restrict their capability to producing

perennial forage crops and improvement practices are feasible.

Class 6 – Soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible.

Class 7 – Soils in this class have no capability for arable culture or permanent pasture.

The capability subclass is a grouping of soils with similar kinds of limitations and hazards affecting agricultural use of soils. The subclass limitations encountered in the County of Beaver are listed below:

Subclass C: adverse climate
Subclass D: undesirable soil structure or low permeability
Subclass E: actual erosion damage
Subclass I: inundation (flooding by streams and lakes)
Subclass M: low moisture-holding capacity
Subclass N: adverse soil salinity
Subclass P: adverse stoniness
Subclass R: shallowness to solid bedrock
Subclass S: a combination of two or more of the limitations D, F, M and N
Subclass T: adverse topography
Subclass W: excess water
Subclass X: minor cumulative limitations

Application of soil capability ratings to soil units

Each symbol which appears on the map corresponds to a particular assemblage of soils and landscape features which can be rated according to the system described above. Some areas contain a uniform grouping of soils and soil phases and can be evaluated as belonging to a single capability class (e.g. 2T). Other areas contain a more complex mixture and must be evaluated in terms of the various different soils included in that unit. For example:

$$1^{4}3^{3}{}_{D}5^{3}{}_{N}$$

would be used to denote an area which contains 40 percent class 1 soil with no limitations, 30 percent class 3 soil which is limited by adverse structure and 30 percent class 5 soil limited by adverse salinity.

The appropriate capability rating for each soil unit/phase notation can be found in table 4.

Estimates of susceptibiity to soil erosion

Soil erosion is controlled by many factors, some of which are related to internal soil characteristics while others are completely external. In the case of water erosion, some important external controlling factors cannot be accurately forecast from information contained on the soil map. These include such attributes as the nature of the vegetative cover, local rainfall intensity and frequency, slope length and orientation, or crop management practices. Quantitative estimates of potential soil erosion losses cannot be made since values for these factors are not known and cannot be predicted based on information available on the soil map.

Since actual soil losses cannot be estimated, the practical alternative is to produce a rating of the comparative inherent erodibility of soils based upon those properties which can be predicted. The most commonly used measure of comparative soil erodibility is the K factor as determined by the method of Wishmeier et al., (1971). This method considers the cumulative effects of soil texture, organic matter content, structure and permeability.

K factors for the soils in the County of Beaver were calculated using the nomograph and methodology of Wischmeier et al., (1971). Data used for particle size and organic matter content were obtained from profiles sampled during soil survey. Average values were calculated when data for more than one profile were available. Data for percent very fine sand are generally not available as this analysis is not standard for soil survey samples. Regression analysis of the data available for percent very fine sand suggested that it was reasonable to assume that 7 percent of the sand fraction would be representative of the very fine sand fraction. Thus, when analytical data for the very fine sand fraction were not available, 7 percent of the sand fraction was accepted as the value for percent very fine sand.

Slope length and gradient factors used are based on those published by Pettapiece, (1984). These factors were calculated for landscapes in the County of Warner and it is reasonable to assume that similar landscapes in the County of Beaver will have similar slope length and gradient characteristics (Pettapiece, pers. comm.).

These values were then applied to the slope angle rating chart (figure 7) (Wall and Dickinson, 1980) to determine the relative erodibility rating of a given soil unit and slope phase. These ratings appear in table 5.

Engineering properties of soils

Soil chemical and physical properties are important factors in the design, construction and maintenance of roads, pipelines, powerlines, buildings and various other facilities. In this regard, the soil properties of importance to the engineer are grain-size distribution, plasticity, compaction, permeability, shrink-swell potential, permeability to water, drainage and salinity. Topography, depth to water table and depth to bedrock are important site factors. Some of these properties were evaluated for several soil groups by Woytowich, (pers. comm.) using data from the Alberta Transportation laboratory collected over the past 25 years. The data for the C horizons of each soil group

Plate 7. Water erosion from spring melt contributes to a continuing concern about the severity and extent of erosion in the region.

Plate 8. Water erosion from intense summer rainfall can cause considerable crop damage as well as the loss of soil.

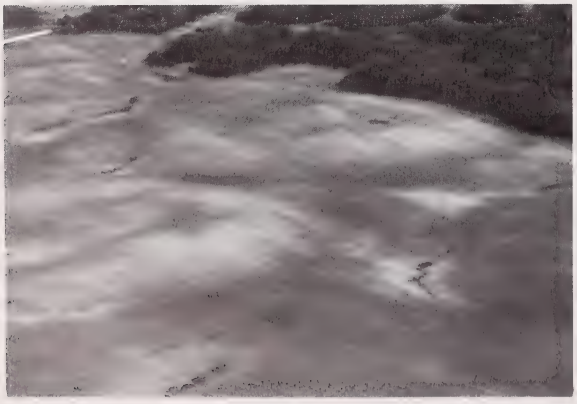

Plate 9. Eroded knolls attest to the continued loss of soil from wind and water erosion and tillage operations.

Plate 10. Soil salinity in some portions of the county is reducing yields and affecting soil management.

mapped in the County of Beaver are presented in table 6.

It should be noted that the laboratory data were correlated with map units of the Soil Survey of Edmonton Sheet (83H) (Bowser et al., 1962). Thus, a particular soil group refers to the map unit with that name. (Woytowich, pers. comm.). Considerable variability is noted for many of the properties; this is reasonable, given the variability of soils within map units. This data is presented to give an estimate of the expected range of properties for soil units in the County of Beaver and

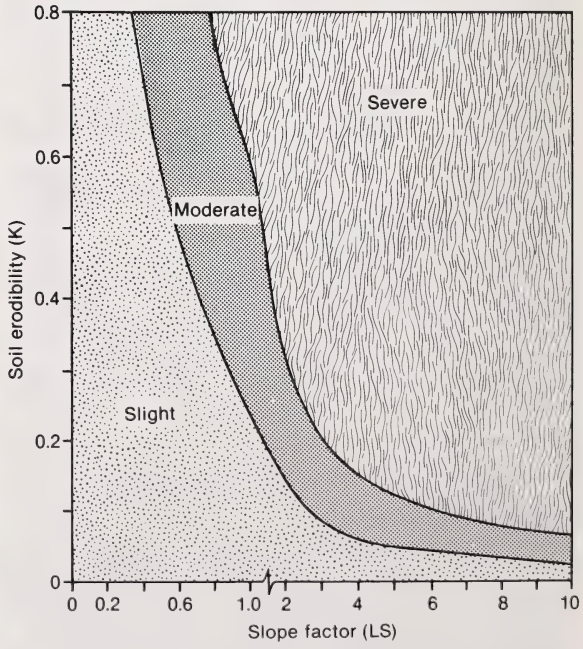

Figure 7. Diagram of slope factor (LS) versus soil erodibility factor (k) used to generate relative erodibility ratings for soil units (Wall and Dickinson 1980).

does not replace on-site investigations by qualified professionals.

Soil salinity in the County of Beaver

Soil unit interpretations for susceptibility for salinization were not made during the soil survey of the county. Salts on the soil surface were most obvious on the Daysland Plain and the Torlea Flats, but it must be noted that portions of the Viking Upland also show signs of salinization. Most areas with Solonetzic soils or a mixture of Solonetzic and Chernozemic soils could be expected to show evidence of salinity during some portion of the year or in occasional years. Soil salinity has the potential of reducing crop yields and creating problems for soil management.

Table 4. Interpretations of soil units for agricultural capability.

Soil unit	Topography	Agricultural capability
AGPH 2	bc	2_X
AGPH 2	c	2_X
AGPH 2	cd	3_T
AGPH 3	bc	$2_T^7\,5_W^3$
AGPH 3	c	$2_T^7\,5_W^3$
AGPO 2	b	2_X
AGPO 2	c	2_X
AGPO 2	cd	3_T
AGPO 2	d	3_T
AGS 2	bc	2_X
AGS 2	c	2_X
AGS 2	cd	3_T
AGS 2	d	3_T
AGS 2	de	4_T
AGS 2	e	4_T
AGS 3	b	$2_T^7\,5_W^3$
AGS 3	c	$2_T^7\,5_W^3$
AGS 3	cd	$3_T^7\,5_W^3$
AGS 3	d	$3_T^7\,5_W^3$
AGS 3	de	$4_T^7\,5_W^3$
AGS 3	e	$4_T^7\,5_W^3$
AGS 7	d	3_T
AGS 7	de	4_T
AGS 8	d	$3_T^7\,5_W^3$
AGS 8	de	$4_T^7\,5_W^3$
Av		6_I
BS 1	b	6_I
BS 2	b	6_M^F
BS 2	c	6_M^F
BS2D2	b	6_M^F
CM		Not rated
CMO 4	b	2_D
CMO 4	bc	2_D
CMO 4	c	2_D
CMO 4	cd	3_T^D
CMO 4	d	3_T^D
CMO 5	b	$3_S^{T7}\,5_W^3$
CMO 5	bc	$3_S^{T7}\,5_W^3$
CMO 5	c	$3_S^{T7}\,5_W^3$
CMO 5	cd	$4_S^{T7}\,5_W^3$
CMO 6	b	3_D
CMO 6	bc	3_D
CMO 6	c	3_D
CMO 6	d	4_D^T
CMO 7	b	$3_D^7\,5_W^3$
CMO 7	c	$3_D^7\,5_W^3$
COA 2	d	4_D^T
COA 2	e	5_T
COA 4	d	4_D^T
COA 4	e	5_T
COA 5	d	$4_D^{T7}\,6_W^3$
COA 5	de	$5_T^7\,6_W^3$
COA 5	e	$5_T^7\,6_W^3$
COA 6	d	$4_D^{T8}\,6_W^2$
COA 6	de	$4_D^{T8}\,6_W^2$
COA 6	e	$4_D^{T8}\,6_W^2$
COA 6	ef	$5_D^{T8}\,6_W^2$
COA 6	f	$5_D^{T8}\,6_W^2$
COA 7	b	$5_D^{T6}\,6_W^4$
COA 7	cd	$5_D^{T6}\,6_W^4$
COA 7	d	$5_D^{T6}\,6_W^4$
COA 7	de	$5_D^{T6}\,6_W^4$
COA 7	e	$5_T^6\,6_W^4$
COA 7	f	$5_T^6\,6_W^4$
COA6/W	d	$4_D^{T8}\,6_W^2$
COA6/W	de	$5_D^{T8}\,6_W^2$
COA7/W	e	$5_T^6\,6_W^4$
COMY 2	cd	4_D^T
COMY 2	d	4_D^T
COMY 3	d	$4_D^{T7}\,6_W^3$
CPL 2	b	4_P^M
CPL 2	c	4_P^M
CPL 2	d	4_P^M
CPL 2	e	5_T^M
CTCO 1	b	$5_T^5\,6_W^5$
CTCO 1	bd	$5_T^5\,6_W^5$
CTCO 1	be	$5_T^5\,6_W^5$
CTW 1	b	6_W
DUG 1	b	4_D
DUG 1	bc	4_D
DUG 1	c	4_D
DYD 4	c	2_D
DYD 4	d	3_D^T
DYD 5	c	$2_D^7\,5_W^3$

Table 4. (continued)

Soil unit	Topography	Agricultural capability
DYD 5	d	$3^{T7}_{D}\,5^{3}_{W}$
EOIR 2	d	3^{T}_{M}
EOR 1	c	1
EOR 1	d	3_{T}
EOR 1	e	4_{T}
EOR 1	f	5_{T}
EOR 2	c	2_{X}
EOR 2	cd	3_{T}
EOR 2	d	3_{T}
EOR 2	de	4_{T}
EOR 2	e	4_{T}
EOR 2	ef	5_{T}
EOR 2	f	5_{T}
EOR 3	b	$2^{7}_{T}\,5^{3}_{W}$
EOR 3	c	$2^{7}_{T}\,5^{3}_{W}$
EOR 3	d	$3^{7}_{T}\,5^{3}_{W}$
EOR 3	de	$4^{7}_{T}\,5^{3}_{W}$
EOR 3	e	$4^{7}_{T}\,5^{3}_{W}$
EOR 3	ef	$5^{7}_{T}\,5^{3}_{W}$
EOR 3	f	$5^{7}_{T}\,5^{3}_{W}$
EOR 4	c	2_{S}
EOR 4	cd	3_{T}
EOR 4	d	3_{T}
EOR 4	e	4_{T}
EOR 4	ef	5_{T}
EOR 5	c	$3^{7}_{T}\,5^{3}_{W}$
EOR 5	cd	$3^{7}_{T}\,5^{3}_{W}$
EOR 5	d	$3^{7}_{T}\,5^{3}_{W}$
EOR 5	e	$4^{7}_{T}\,5^{3}_{W}$
EOR 10	e	4^{E}_{T}
EOR 10	f	5^{E}_{T}
GBY 2	b	2_{D}
GP		Not rated
HEIM 4	d	3^{T}_{M}
HER 2	c	2_{X}
HER 3	c	$2^{7}_{T}\,5^{3}_{W}$
HER 4	c	2_{D}
HER 4	cd	3^{T}_{D}
HER 4	d	3^{T}_{D}
HER 4	e	4^{T}_{D}
HER 5	c	$3^{7}_{D}\,5^{3}_{W}$
HER 5	cd	$3^{T7}_{D}\,5^{3}_{W}$
HER 5	d	$3^{T7}_{D}\,5^{3}_{W}$
HGT 1	b	5_{W}
HGT 1	c	5_{W}
HGT 2	b	5_{W}
HGT 2	c	5_{W}
HGT 3	b	5_{W}
HGT 3	bc	5_{W}

Table 4. (continued)

Soil unit	Topography	Agricultural capability
HGT 3	c	5_{W}
HGT 3	cd	5_{W}
HGT 3	d	$5^{7}_{W}4^{3}_{T}$
IRM 2	c	3_{M}
IRM 2	d	4^{M}_{T}
KLM 4	b	3_{D}
KLM 4	bc	3_{D}
KLM 4	c	3_{D}
KLM 4	cd	3^{D}_{T}
KLM 4	d	3^{D}_{T}
KLM 5	b	$3^{7}_{D}5^{3}_{W}$
KLM 5	bc	$3^{7}_{D}5^{3}_{W}$
KLM 5	c	$3^{7}_{D}5^{3}_{W}$
KLM 6	b	3_{D}
KLM 6	bc	3_{D}
KLM 6	c	3_{D}
KLM 6	cd	4^{D}_{T}
KLM 6	d	4^{D}_{T}
KLM 7	b	$4^{7}_{S}5^{3}_{W}$
KLM 7	bc	$4^{7}_{S}5^{3}_{W}$
KLM 7	c	$4^{7}_{S}5^{3}_{W}$
KNA 1	c	5^{P}_{M}
KNA 1	d	5^{P}_{M}
LB 4	b	6_{I}
LTUN 2	d	4^{M}_{D}
MCMW 2	c	3_{D}
MCMW 3	d	4^{T}_{D}
NRM 4	b	2_{D}
NRM 4	bc	2_{D}
NRM 4	c	2_{D}
NRM 4	cd	3^{T}_{D}
NRM 4	d	3^{T}_{D}
NRM 5	b	$3^{T7}_{D}\,5^{3}_{W}$
NRM 5	c	$3^{T7}_{D}\,5^{3}_{W}$
NRM 5	cd	$3^{T7}_{D}\,5^{3}_{W}$
NRM 5	d	$3^{T7}_{D}\,5^{3}_{W}$
PHS 2	b	2_{M}
PHS 2	c	2_{M}
PHS 2	cd	3^{M}_{T}
PHS 2	d	3^{M}_{T}
POK 2	b	2_{X}
POK 2	c	2_{X}
RB 1	ef	6_{T}
RB 1	f	6_{T}
RB 1	g	6_{T}
RB 3	d	$6^{7}_{T}\,5^{3}_{W}$
RB 3	de	$6^{7}_{T}\,5^{3}_{W}$
RB 3	e	$6^{7}_{T}\,5^{3}_{W}$
RB 3	ef	$6^{7}_{T}\,5^{3}_{W}$

Table 4. (continued)

Soil unit	Topography	Agricultural capability
SHS 4	b	4_D
SHS 4	bc	4_D
SHS 4	c	4_D
SHS 5	b	$4^{7}_{D}6^{3}_{W}$
SHS 5	bc	$4^{7}_{D}6^{3}_{W}$
SHS 5	c	$4^{7}_{D}6^{3}_{W}$
TOA 4	c	1
TOA 5	c	2_X
UCS 5	c	3_D
UCS 5	d	4^{T}_{D}
UCS 5	e	5_T
UCS 6	d	$4^{T7}_{D}6^{3}_{W}$
UCS 6	de	$5^{7}_{T}6^{3}_{W}$
UCS 6	e	$5^{7}_{T}6^{3}_{W}$

Table 5. Erodibility ratings for soil units mapped in the County of Beaver (Ap Horizons).

Map unit	Slope	*Rating
AGPH 2	bc	SL
AGPH 2	c	SL
AGPH 2	cd	SL
AGPH 3	bc	SL
AGPH 3	c	SL
AGPO 2	b	SL
AGPO 2	c	SL
AGPO 2	cd	SL
AGPO 2	d	SL
AGS 2	bc	SL
AGS 2	c	SL
AGS 2	cd	SL
AGS 2	d	SL
AGS 2	de	M
AGS 2	e	M
AGS 3	b	SL
AGS 3	c	SL
AGS 3	cd	SL
AGS 3	d	SL
AGS 3	de	M
AGS 3	e	M
AGS 7	d	SL
AGS 7	de	M
AGS 8	d	SL
AGS 8	de	M
AV		NOT RATED
BS 1	b	NOT RATED
BS 2	b	NOT RATED
BS 2	c	NOT RATED
BS2D2	b	SE
CM		NOT RATED
CMO 4	b	SL
CMO 4	bc	SL
CMO 4	c	SL

Table 5. (continued)

Map unit	Slope	*Rating
CMO 4	cd	SL
CMO 4	d	SL
CMO 5	b	SL
CMO 5	bc	SL
CMO 5	c	SL
CMO 5	cd	SL
CMO 6	b	SL
CMO 6	bc	SL
CMO 6	c	SL
CMO 6	d	SL
CMO 7	b	SL
CMO 7	c	SL
COA 2	d	M
COA 2	e	SE
COA 4	d	M
COA 4	e	SE
COA 5	d	M
COA 5	de	SE
COA 5	e	SE
COA 6	d	M
COA 6	de	SE
COA 6	e	SE
COA 6	ef	SE
COA 6	f	SE
COA 7	b	SL
COA 7	cd	SL
COA 7	d	M
COA 7	de	SE
COA 7	e	SE
COA 7	f	SE
COA6/W	d	M
COA6/W	de	SE
COA7/W	e	SE
COMY 2	cd	M
COMY 2	d	M
COMY 3	d	M
CPL 2	b	SL
CPL 2	c	SL
CPL 2	d	SL
CPL 2	e	SL
CTCO 1	b	SL
CTCO 1	bd	M
CTCO 1	be	M
CTW 1	b	SL
DUG 1	b	SL
DUG 1	bc	SL
DUG 1	c	SL
DYD 4	c	SL
DYD 4	d	SL
DYD 5	c	SL
DYD 5	d	SL
EOIR 2	d	SL
EOR 1	c	SL
EOR 1	d	SL

Table 5. (continued)

Map unit	Slope	*Rating
EOR 1	e	M
EOR 1	f	SE
EOR 2	c	SL
EOR 2	cd	SL
EOR 2	d	SL
EOR 2	de	M
EOR 2	e	M
EOR 2	ef	M
EOR 2	f	SE
EOR 3	b	SL
EOR 3	c	SL
EOR 3	d	SL
EOR 3	de	M
EOR 3	e	M
EOR 3	ef	SE
EOR 3	f	SE
EOR 4	c	SL
EOR 4	cd	SL
EOR 4	d	SL
EOR 4	e	M
EOR 4	ef	M
EOR 5	c	SL
EOR 5	cd	SL
EOR 5	d	SL
EOR 5	e	M
EOR 10	e	M
EOR 10	f	SE
GBY 2	b	SL
GP		NOT RATED
HEIM 4	d	SL
HER 2	c	SL
HER 3	c	SL
HER 4	c	SL
HER 4	cd	SL
HER 4	d	SL
HER 4	e	M
HER 5	c	SL
HER 5	cd	SL
HER 5	d	SL
HGT 1	b	SL
HGT 1	c	SL
HGT 2	b	SL
HGT 2	c	SL
HGT 3	b	SL
HGT 3	bc	SL
HGT 3	c	SL
HGT 3	cd	SL
HGT 3	d	SL
IRM 2	c	SL
IRM 2	d	SL
KLM 4	b	SL
KLM 4	bc	SL
KLM 4	c	SL
KLM 4	cd	SL

Table 5. (continued)

Map unit	Slope	*Rating
KLM 4	d	SL
KLM 5	b	SL
KLM 5	bc	SL
KLM 5	c	SL
KLM 6	b	SL
KLM 6	bc	SL
KLM 6	c	SL
KLM 6	cd	SL
KLM 6	d	SL
KLM 7	b	SL
KLM 7	bc	SL
KLM 7	c	SL
KNA 1	c	SL
KNA 1	d	SL
LB 4	b	NOT RATED
LTUN 2	d	SL
MCMW 2	c	SL
MCMW 3	d	SL
NRM 4	b	SL
NRM 4	bc	SL
NRM 4	c	SL
NRM 4	cd	SL
NRM 4	d	SL
NRM 5	b	SL
NRM 5	c	SL
NRM 5	cd	SL
NRM 5	d	SL
PHS 2	b	SL
PHS 2	c	SL
PHS 2	cd	SL
PHS 2	d	SL
POK 2	b	SL
POK 2	c	SL
RB 1	ef	SE
RB 1	f	SE
RB 1	g	SE
RB 3	d	SE
RB 3	de	SE
RB 3	e	SE
RB 3	ef	SE
SHS 4	b	SL
SHS 4	bc	SL
SHS 4	c	SL
SHS 5	b	SL
SHS 5	bc	SL
SHS 5	c	SL
TOA 4	c	SL
TOA 5	c	SL
UCS 5	c	SL
UCS 5	d	SL
UCS 5	e	M
UCS 6	d	SL
UCS 6	de	M
UCS 6	e	M

*Ratings
SL – slight; M – moderate; SE – severe

Table 6. Statistical summary of engineering test data for the soil groups in the County of Beaver (extracted from Woytowich, 1980).

Soil group	Property	# of samples	Mean	Standard deviation	*USCS
Angus Ridge	#40 (% passing sieve #40)	2225	93.4	6.1	
	#200 (% passing sieve #200)	2225	66.6	14.4	
	LL (liquid limit)	2225	36.2	10.5	
	PL (plastic limit)	2225	15.8	3.3	
	PI (plasticity index)	2225	20.6	8.6	
	EOMC (%)	2225	15.3	4.2	
	EPD (Kg/m^3)	2220	1822.5	198.3	
	Likely Unified Soil Classification				CL
Camrose	#40 (% passing sieve #40)	772	94.0	6.7	
	#200 (% passing sieve #200)	772	67.5	14.4	
	LL (liquid limit)	772	41.1	12.8	
	PL (plastic limit)	772	15.9	3.6	
	PI (plasticity index)	772	25.2	11.2	
	EOMC (%)	772	15.8	3.6	
	EPD (Kg/m^3)	772	1797.1	117.8	
	Likely Unified Soil Classification				CH,CL
Cooking Lake	#40 (% passing sieve #40)	641	94.1	4.0	
	#200 (% passing sieve #200)	641	68.2	10.1	
	LL (liquid limit)	641	39.2	10.2	
	PL (plastic limit)	641	14.8	3.9	
	PI (plasticity index)	641	24.5	7.6	
	EOMC (%)	641	14.7	3.2	
	EPD (Kg/m^3)	641	1841.8	113.1	
	Likely Unified Soil Classification				CL
Killam	#40 (% passing sieve #40)	8	92.6	5.1	
	#200 (% passing sieve #200)	8	68.5	9.8	
	LL (liquid limit)	8	35.6	4.7	
	PL (plastic limit)	8	13.6	2.0	
	PI (plasticity index)	8	22.0	3.8	
	EOMC (%)	8	13.8	2.1	
	EPD (Kg/m^3)	8	1882.0	71.6	
	Likely Unified Soil Classification				CI
Macola	#40 (% passing sieve #40)	43	95.7	3.7	
	#200 (% passing sieve #200)	43	75.0	12.0	
	LL (liquid limit)	43	45.4	13.9	
	PL (plastic limit)	43	17.6	4.2	
	PI (plasticity index)	43	27.8	10.5	
	EOMC (%)	43	18.2	4.7	
	EPD (Kg/m^3)	43	1738.9	146.8	
	Likely Unified Soil Classification				CH
Peace Hills	#40 (% passing sieve #40)	283	92.4	11.2	
	#200 (% passing sieve #200)	283	59.9	20.7	
	LL (liquid limit)	283	33.8	13.4	
	PL (plastic limit)	283	16.3	5.2	
	PI (plasticity index)	283	17.7	11.2	
	EOMC (%)	283	14.5	4.7	
	EPD (Kg/m^3)	283	1828.1	141.5	
	Likely Unified Soil Classification				CL,ML
Ponoka	#40 (% passing sieve #40)	565	95.5	6.1	
	#200 (% passing sieve #200)	565	71.6	19.9	
	LL (liquid limit)	565	43.0	19.2	
	PL (plastic limit)	565	17.8	4.7	
	PI (plasticity index)	565	25.2	15.8	
	EOMC (%)	565	17.5	5.5	
	EPD (Kg/m^3)	565	1749.0	169.5	
	Likely Unified Soil Classification				CH,CL

Table 6. (continued)

Soil group	Property	# of samples	Mean	Standard deviation	*USCS
Uncas	#40 (% passing sieve #40)	52	94.4	3.7	
	#200 (% passing sieve #200)	52	70.1	15.4	
	LL (liquid limit)	52	42.1	15.0	
	PL (plastic limit)	52	18.0	3.7	
	PI (plasticity index)	52	24.8	11.4	
	EOMC (%)	52	17.8	4.5	
	EPD (Kg/m^3)	52	1737.7	140.6	
	Likely Unified Soil Classification				CH,CL

* USCS – Unified System of Soil Classification.

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Appendix A. Soil morphological descriptions and analytical data of representative soil profiles.

Angus Ridge (AGS)

Classification: Eluviated Black
Parent material: Till
Profile location: NE15 20 50 19 W4
Map Unit: AGS2/d
Topography: Slightly hummocky
Slope position: Mid

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ah	0-30	10YR 2/1(w)	loam	weak, medium granular		abrupt, wavy	
Ae	30-36	10YR 5/6	silt loam	moderate, medium platy	friable	gradual, smooth	
Bt	36-75	10YR 5/6	clay loam	weak, coarse prismatic strong, medium sub-angular blocky	firm		
BC	75-130	10YR 2/2	silty clay loam	strong, subangular blocky, weak, moderate columnar	loose		
Ck	130+		loam				

Analytical data

		Exchangeable cations (meq/100 g)				Total exch.	Soluble cations (meq/100 g)								Electrical	
Horizon	Ph H_2O	Na	K	Ca	Mg	capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	cond.	$\%CaCO_3$
Ah	6.0	.09	.30	24.0	3.84	22.7	ND	ND	ND	ND	33.0	45.0	22.0	L	ND	ND
Ae	6.2	.09	.28	9.7	3.95	11.7	ND	ND	ND	ND	34.0	41.0	25.0	L	ND	ND
Bt	6.4	.26	.39	11.5	6.60	14.5	ND	ND	ND	ND	37.0	29.0	34.0	CL	ND	ND
BC	6.7	.34	.41	19.5	10.20	21.8	ND	ND	ND	ND	19.0	41.0	40.0	SiCL	ND	ND
Ck	7.4	.35	.34	20.0	7.12	13.3	ND	ND	ND	ND	29.0	47.0	24.0	L	ND	1.4

Appendix A. (continued)

Camp Lake (CPL)

Classification: Orthic Black Chernozemic
Parent material: Glaciofluvial
Profile location: NW13 27 47 11 W4
Map unit: CPL2/d
Topography: Slightly hummocky
Slope position: Mid

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-18	10YR 2/1	sandy loam	fine granular	friable	gradual, smooth	plentiful fine random
Bm1	18-70	10YR 4/4	loamy sand	single grain to weak subangular blocky	friable, slightly hard	abrupt, smooth	very few fine and medium vertical
Bm2	70-85	10YR 5/6	sandy loam	moderate coarse blocky	hard to very hard	abrupt, smooth	very few & very fine vertical
BC	90+	10YR 4/6	sandy loam	amorphous	friable		no roots

Analytical data

		Exchangeable cations (meq/100 g)				Total	Soluble cations (meq/100 g)									
Horizon	Ph H_2O	Na	K	Ca	Mg	exch. capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	%$CaCO_3$
Ap	6.3	.19	.93	17.4	3.42	26.2	ND	ND	ND	ND	64.0	25.0	11.0	SL	ND	ND
Bm1	6.4	.05	.31	3.3	1.22	5.3	ND	ND	ND	ND	78.0	15.0	7.0	LS	ND	ND
Bm2	6.5	.15	.51	5.7	3.89	10.3	ND	ND	ND	ND	68.0	15.0	17.0	SL	ND	ND
BC	6.8	.14	.37	4.9	3.97	8.4	ND	ND	ND	ND	69.0	16.0	15.0	SL	ND	ND

Appendix A. (continued)

Camrose (CMO)

Classification: Black Solodized Solonetz
Parent material: Till
Profile location: NE15 9 50 18 W4
Map unit: CM04/b
Topography: Undulating
Slope position: Mid
Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-15	10YR 2/2(m)	silt loam	weak granular	very friable loose	abrupt, smooth	plentiful fine and medium exped
Ah	15-26	10YR 2/2	silt loam to loam	weak prismatic (coarse) to moderate medium sub-angular blocky	firm	clear, smooth	plentiful fine and medium random exped
Ahe	26-30	not sampled	silt loam to loam	platy to granular	friable		
Ae	30-36	10YR 5/2(m)	silt loam	strong medium platy	friable	abrupt, smooth	few, fine vertical exped
Bnt1gj	36-48	ped exterior 10YR 2/1 ped interior 10YR 4/4	no field texture	strong coarse columnar round top	very firm to very hard	clear, smooth	few to plentiful fine vertical and horizontal exped
Bnt2gj	48-56	exterior 10YR 2/1 interior 10YR 3/3	no field texture	strong coarse columnar breaking to strong coarse blocky	very firm to very hard	clear, smooth	few, fine vertical horizontal
BCgj	56-65	10YR 4/4	clay loam till	weak medium subangular blocky	firm	abrupt, smooth	very few, fine, random
Csak	65+	10YR 4/3	silty clay to silty clay loam				

Analytical data

Horizon	Ph H_2O	Exchangeable cations (meq/100 g) Na	K	Ca	Mg	Total exch. capacity	Soluble cations (meq/100 g) Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	$\%CaCO_3$
Ap	6.3	.38	1.23	21.1	5.08	38.0	ND	ND	ND	ND	48.0	55.0	27.0	SCL	ND	ND
Ah	5.8	.82	.27	13.0	5.14	30.9	ND	ND	ND	ND	24.0	51.0	25.0	SiL	ND	ND
Ae	6.6	.95	.16	1.8	2.88	9.2	ND	ND	ND	ND	23.0	65.0	12.0	SiL	ND	ND
Bnt1gj	7.1	4.50	.60	5.2	10.65	26.2	ND	ND	ND	ND	24.0	43.0	33.0	CL	ND	ND
Bnt2gj	7.5	6.01	.63	5.1	12.49	27.1	ND	ND	ND	ND	28.0	38.0	34.0	CL	ND	ND
BCgj	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.0	43.0	35.0	CL	ND	ND
Csak	8.2	ND	ND	ND	ND	ND	101.39	.65	24.5	50.27	23.0	48.0	29.0	CL	ND	3.8

Appendix A. (continued)

Cooking Lake (COA)

Classification: Orthic Gray Luvisol
Parent material: Till
Profile location: SW5 29 51 19 W4
Map unit: COA6/d-e
Topography: Hummocky
Slope position: Upper

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
LFH	8-0						
Ae	0-13	10YR 5/3	loam	strong, coarse platy	friable	abrupt, smooth	
AB	13-24	10YR 4/3	clay loam	strong, medium coarse subangular blocky	firm	clear, smooth	
Bt1	24-75	10YR 4/3	clay loam	weak coarse columnar to strong coarse and medium subangular blocky	very firm	gradual, wavy	
Bt2	75-120	10YR 4/3	clay loam	strong, coarse blocky			
Ck	120+		clay loam				

Analytical data

		Exchangeable cations (meq/100 g)				Total	Soluble cations (meq/100 g)									
Horizon	Ph H_2O	Na	K	Ca	Mg	exch. capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	$\%CaCO_3$
Ae	6.4	.01	.18	3.1	.31	4.2	ND	ND	ND	ND	52.0	35.0	13.0	L	ND	ND
AB	6.1	.08	.31	8.9	2.56	13.3	ND	ND	ND	ND	38.0	43.0	29.0	CL	ND	ND
Bt1	5.9	.11	.30	10.8	3.74	16.9	ND	ND	ND	ND	40.0	29.0	31.0	CL	ND	ND
Bt2	6.1	.07	28	10.3	3.84	14.8	ND	ND	ND	ND	39.0	33.0	28.0	CL	ND	ND
Ck	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.0	35.0	26.0	L	ND	3.3

Appendix A. (continued)

Elnora (EOR)

Classification: Orthic Black Chernozemic
Parent material: Till
Profile location: NE15 36 46 11 W4
Map unit: EOR2/e
Topography: Hummocky
Slope position: Mid-upper

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-15	10YR 2/2	loam	strong fine granular	loose to firm (lower Ap is firm)	abrupt, smooth	plentiful fine random exped
Bm1	15-30	10YR 5/6	silt loam	moderate to coarse prismatic to strong medium subangular block	firm	gradual, smooth	few fine random exped
Bm2	30-50	10YR 4/6 crushed & moist	silt loam	weak coarse prismatic to strong medium sub-angular blocky	firm	abrupt, smooth	few fine random
Cca	60-80	10YR 5/4 crushed & moist	loam				

Analytical data

Horizon	Ph H_2O	Exchangeable cations (meq/100 g) Na	K	Ca	Mg	Total exch. capacity	Soluble cations (meq/100 g) Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	$\%CaCO_3$
Ap	7.3	.01	.88	28.1	3.43	ND	ND	ND	ND	ND	40.0	39.0	21.0	L	ND	ND
Bm1	7.5	.01	.54	14.0	7.31	ND	ND	ND	ND	ND	26.0	49.0	25.0	SiL	ND	ND
Bm2	7.5	.07	.50	8.8	8.62	ND	ND	ND	ND	ND	24.0	54.0	22.0	SiL	ND	ND
Cca	7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	41.0	33.0	26.0	L	ND	18.7

Appendix A. (continued)

Haight (HGT)

Classification: Orthic Humic Gleysol
Parent material: Glaciolacustrine
Profile location: SW4 9 49 18 W4
Map unit: HGT1/b
Topography: Level
Slope position: Depressional
Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ah1	0-10	10YR 3/1	silt clay loam	weak fine granular to amorphous	very friable	abrupt, smooth	abundant very fine to fine vertical & random
Ah2	10-35	10YR 2/1	clay to silty clay	weak coarse prismatic breaks to massive or strong fine subangular blocky	firm	abrupt, wavy	few, fine vertical
BCg	35-45	10YR 5/1 many fine to medium mottles	clay to silty clay	strong fine subangular blocky	firm	clear, smooth	very few, fine vertical
Cgk	45-80	matrix 10YR 5/1 mottles 10YR 5/6 (common fine)	silty clay	strong fine subangular	firm blocky		
IICgsak	@80-90	10YR 4/1 common fine mottles 10YR 4/6	no field texture	massive (accumulation of gypsum)			
IICgk	@ 90						

Analytical data

Horizon	Ph H_2O	Exchangeable cations (meq/100 g) Na	K	Ca	Mg	Total exch. capacity	Soluble cations (meq/100 g) Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	%$CaCO_3$
Ah1	6.8	6.53	2.51	31.2	8.12	ND	ND	ND	ND	ND	8.0	56.0	36.0	SiCL	ND	ND
Ah2	7.5	4.09	2.67	20.4	6.37	ND	ND	ND	ND	ND	9.0	48.0	43.0	SiC	ND	ND
BCg	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	43.0	42.0	SiC	ND	ND
Cgk	7.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	45.0	45.0	SiC	ND	5.9
IICgsak	7.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	47.0	35.0	18.0	L	ND	3.0
IICgk	7.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	43.0	32.0	25.0	L	ND	3.8

Appendix A. (continued)

Heisler (HER)

Classification: Solonetzic Black
Parent material: Till
Profile location: NW11 29 49 12 W4
Map unit: HER4/c-d
Topography: Undulating
Slope position: Upper

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-17	10YR 2/2	loam	weak fine granular	friable	clear, smooth	
Ae	17-22	10YR 4/3(m)	silt loam to loam	strong fine platy		abrupt, smooth	
Btnj1	22-38	10YR 4/4	silty clay loam to clay loam	weak columnar to strong medium sub-angular blocky	firm	gradual, smooth	
Btnj2	38-60	10YR 4/4	clay loam	moderate coarse columnar to strong medium blocky	firm	abrupt, smooth	
Csak	60+	10YR 4/3	loam				

Analytical data

		Exchangeable cations (meq/100 g)				Total	Soluble cations (meq/100 g)								Electrical	
Horizon	Ph H_2O	Na	K	Ca	Mg	exch. capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	cond.	$\%CaCO_3$
Ap	5.9	.06	.66	18.8	4.09	33.6	ND	ND	ND	ND	38.0	40.0	22.0	L	ND	ND
Ae	6.4	.08	.25	6.6	2.40	12.1	ND	ND	ND	ND	38.0	45.0	17.0	L	ND	ND
Btnj1	6.4	.22	.47	10.5	5.40	23.0	ND	ND	ND	ND	38.0	31.0	31.0	CL	ND	ND
Btnj2	6.6	.31	.49	9.7	5.43	14.5	ND	ND	ND	ND	38.0	33.0	29.0	CL	ND	ND
Csak	7.6	ND	ND	ND	ND	ND	6.68	.29	7.0	4.63	41.0	33.0	26.0	L	ND	6.2

Appendix A. (continued)

Irma (IRM)

Classification: Orthic Black Chernozemic
Parent material: Glaciofluvial
Profile location: SE1 18 47 11 W4
Map unit: IRM2/d
Topography: Slightly hummocky
Slope position: Mid

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-24	10YR 2/2(m) - 3/1(d)	sandy loam	single grain, loose	friable	clear, smooth	
Bm1	24-33	10YR 4/4	sandy loam	weak medium subangular blocky to single grain	hard	abrupt, smooth	
Bm2	33-56	10YR 4/6	sandy loam	coarse prismatic to strong medium sub-angular blocky	hard	abrupt, smooth	
BC	56-110	10YR 5/6	sand	single grain	slightly hard	abrupt, smooth	
Ck	110+						

Analytical data

		Exchangeable cations (meq/100 g)				Total	Soluble cations (meq/100 g)								Electrical	
Horizon	Ph H_2O	Na	K	Ca	Mg	exch. capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	cond.	$\%CaCO_3$
Ap	5.7	.11	.52	11.1	1.89	12.1	ND	ND	ND	ND	73.0	19.0	8.0	SL	ND	ND
Bm1	6.5	.01	.26	7.3	2.96	4.8	ND	ND	ND	ND	60.0	24.0	16.0	SL	ND	ND
Bm2	6.4	.01	.18	4.7	1.61	4.6	ND	ND	ND	ND	76.0	16.0	8.0	SL	ND	ND
Bc	6.6	.01	.11	2.1	.85	3.1	ND	ND	ND	ND	92.0	4.0	4.0	S	ND	ND
Ck	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	47.0	36.0	17.0	L	ND	5.1

Appendix A. (continued)

Killam (KLM)

Classification: Black Solodized Solonetz
Parent material: Till
Profile location: SE8 34 47 13 W4
Map unit: KLM4/c
Topography: Undulating
Slope position: Mid

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-13	10YR 2/1(m)	loam	weak fine granular random exped	loose	abrupt, smooth	plentiful fine
Ae	13-18	10YR 5/3	loam to silt loam	strong medium fine platy	firm	clear, wavy	very few fine random exped
Bnt1	18-32	10YR 3/3	no field texture	strong coarse columnar with round tops to strong coarse blocky	very firm	gradual, smooth	very few fine vertical exped
Bnt2	32-50	10YR 3/2	no field texture	strong coarse prismatic to strong coarse blocky	very firm	abrupt, smooth	very few fine random
Csak	50-80		clay loam till				

Analytical data

		Exchangeable cations (meq/100 g)				Total exch.	Soluble cations (meq/100 g)								Electrical	
Horizon	Ph H_2O	Na	K	Ca	Mg	capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	cond.	$\%CaCO_3$
Ap	5.5	.30	1.64	11.5	3.15	ND	ND	ND	ND	ND	42.0	40.0	18.0	L	ND	ND
Ae	6.1	.70	.22	4.1	2.72	ND	ND	ND	ND	ND	50.0	36.0	14.0	L	ND	ND
Bnt1	6.9	3.44	.69	6.3	11.90	22.7	ND	ND	ND	ND	37.0	31.0	32.0	CL	ND	ND
Bnt2	7.6	ND	ND	ND	ND	ND	4.14	.59	4.7	11.42	45.0	24.0	31.0	CL	ND	ND
Csak1	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	36.0	38.0	26.0	L	ND	5.3
Csak2	7.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.0	35.0	28.0	L	ND	5.7

Appendix A. (continued)

Macola (MCA)

Classification: Dark Gray Luvisol
Parent material: Glaciolacustrine
Profile location: SW4 28 50 20 W4
Map unit: COA4/e
Topography: Hummocky
Slope position: Upper

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-15	10YR 2/1(m)	silty clay	moderate, medium subangular blocky	firm	abrupt, smooth	
Ae	15-16	10YR 4/2	silt loam	weak fine to weak platy	firm	abrupt, smooth	
AB	16-20	10YR 4/2	silty clay	strong, medium sub-angular blocky	firm	clear, smooth	
Bt	20-80	10YR 3.5/2	silty clay	strong, coarse to medium subangular blocky	very firm		
Ck	80+	10YR 4/2	silty clay to silty loam				

Analytical data

		Exchangeable cations (meq/100 g)				Total exch.	Soluble cations (meq/100 g)								Electrical	
Horizon	Ph H_2O	Na	K	Ca	Mg	capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	cond.	$\%CaCO_3$
Ah	6.6	.06	1.76	25.4	11.90	45.4	ND	ND	ND	ND	2.0	56.0	42.0	SiC	ND	ND
Bt	5.4	.46	.60	13.1	13.40	35.1	ND	ND	ND	ND	1.0	40.0	59.0	SiC	ND	ND
Ck	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	46.0	54.0	SiC	ND	3.7

Appendix A. (continued)

Shonts (SHS)

Classification: Black Solodized Solonetz
Parent material: Till
Profile location: SE1 29 49 13 W4
Map unit: KLM6/c
Topography: Undulating
Slope position: Mid

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-9	10YR 2/2	silt loam	weak to moderate	friable	abrupt, smooth	
Ae	9-10						
Bnt1	12-22	ped exterior 10YR 2/2 ped interior 10YR 4/4	no field texture	columnar round top to strong medium blocky	very firm	clear, smooth	
Bnt2	22-40	ped exterior 10YR 2/2 ped interior 10YR 4/4-3	no field texture	moderate coarse columnar to strong medium blocky	very firm	abrupt, smooth	
Csak	40+	10YR 4/3	clay loam				

Analytical data

		Exchangeable cations (meq/100 g)					Soluble cations (meq/100 g)									
Horizon	Ph H_2O	Na	K	Ca	Mg	Total exch. capacity	Na	K	Ca	Mg	%Sand	%Silt	%Clay	Text	Electrical cond.	$\%CaCO_3$
Ap	5.5	1.72	.74	5.7	2.61	35.0	ND	ND	ND	ND	32.0	51.0	17.0	SiL	ND	ND
Bnt1	6.9	10.51	.59	6.9	11.03	35.0	ND	ND	ND	ND	32.0	41.0	27.0	L	ND	ND
Bnt2	7.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	33.0	34.0	33.0	CL	ND	ND
Csak	7.9	ND	ND	ND	ND	ND	124.96	.56	26.7	31.59	38.0	33.0	29.0	CL	ND	3.1

Thomas Lake (TOA)

Classification: Orthic Black Chernozemic
Parent material: Glaciolacustrine
Profile location: NW12 31 46 11 W4
Map unit: TOA4/c
Topography: Undulating
Slope position: Upper

Description of profile:

Horizon	Depth (cm)	Color	Field texture	Structure	Consistence	Boundary	Roots
Ap	0-13	10YR 3/2(m) 10YR 4/2(d)	silty clay	strong fine granular	friable	abrupt, smooth	
Bm	13-46	10YR 3/2(m)	clay	strong coarse prismatic to strong medium blocky	very firm	smooth	
Ck	46+	10YR 3/2(m)	silty clay				

Analytical data

Horizon	Ph	Exchangeable cations (meq/100 g)				Total exch. capacity	Soluble cations (meq/100 g)				%Sand	%Silt	%Clay	Text	Electrical cond.	%$CaCO_3$
	H_2O	Na	K	Ca	Mg		Na	K	Ca	Mg						
Ap	5.5	.47	1.56	12.4	9.56	38.0	ND	ND	ND	ND	6.0	42.0	52.0	SiC	ND	ND
Bm	6.2	.98	1.26	16.9	15.65	45.0	ND	ND	ND	ND	3.0	32.0	65.0	HC	ND	ND
Ck	7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0	41.0	59.0	SiC	ND	4.0

Appendix B. Glossary of terms

Definition of terms

Summary of Canadian System of Soil Classification (1978)

Mineral horizons and layers

Mineral horizons contain 17 percent or less organic C (about 30 percent organic matter) by weight.

A – This is a mineral horizon formed at or near the surface in the zone of leaching or eluviation of materials in solution or suspension, or of maximum in situ accumulation of organic matter or both.

B – This is a mineral horizon characterized by enrichment in organic matter, sesquioxides, or clay; or by the development of soil structure; or by a change of color denoting hydrolysis, reduction or oxidation.

C – This is a mineral horizon comparatively unaffected by the pedogenic processes operative in A and B, (C), except the process of gleying (Cg), and the accumulation of calcium and magnesium carbonates (Cca) and more soluble salts (Cs, Csa).

Organic horizons

Organic horizons are found in Organic soils and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils or overlying geologic deposits. They contain more than 17 percent organic C (approximately 30 percent organic matter) by weight. Two groups of these horizons are recognized, the O horizons and the L, F and H horizons.

O – This is an organic horizon developed mainly from mosses, rushes and woody materials.

L – This is an organic horizon that is characterised by an accumulation of organic matter derived mainly from leaves, twigs and woody materials in which the original structures are easily discernible.

F – This is an organic horizon that is characterized by an accumulation of partly decomposed organic matter derived mainly from leaves, twigs and woody materials.

H – This is an organic horizon that is characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible.

Lower case suffixes

ca – A horizon of secondary carbonate enrichment in which the concentration of lime exceeds that in the unenriched parent material.

e – A horizon characterized by the eluviation of clay, Fe, Al or organic matter alone or in combination.

g – A horizon characterized by gray colors, or prominent mottling, or both, indicative of permanent or periodic intense reduction.

h – A horizon enriched with organic matter.

j – This is used as a modifier of suffixes e, f, g, n and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies.

k – Denotes the presence of carbonate as indicated by visible effervescence when dilute HC1 is added.

m – A horizon slightly altered by hydrolysis, oxida- tion or solution or all three to give a change in color or structure or both.

n – A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less.

p – A horizon disturbed by man's activities such as cultivation, logging and habitation.

s – A horizon with salts, including gypsum, which may be detected as crystals or veins, as surface crusts of salt crystals, by depressed crop growth or by the presence of salt-tolerant plants.

sa – A horizon with secondary enrichment of salts more soluble than Ca and Mg carbonates; the concentration of salts exceeds that in the unenriched parent material.

t – An illuvial horizon enriched with silicate clay.

Topography

There are 10 slope classes, and each one is defined in terms of percent and degrees.

Class	Slope (%)	Approximate degrees	Terminology
1(a)	0 - 0.5	0	Level
2(b)	0.5 - 2.0	0.3 - 1.1	Nearly level
3(c)	2 - 5	1.1 - 3	Very gentle slopes
4(d)	5 - 9	3 - 5	Gentle slopes
5(e)	9 - 15	5 - 8.5	Moderate slopes
6(f)	15 - 30	8.5 - 16.5	Strong slopes
7(g)	30 - 45	16.5 - 24	Very strong slopes
8(h)	45 - 70	24 - 35	Extreme slopes

Throughout this report, descriptive terms are used repeatedly to describe features of significance within the map area. The following are definitions of some of these descriptive terms.

Soil texture

Soil separates (particle size) on which textural classes are based

Separates	Diameter in millimeters
Very Coarse Sand (V.C.S.)	2.0 - 1.0
Coarse Sand (C.S.)	1.0 - 0.5
Medium Sand (M.S.) Sand (S.)	0.5 - 0.25
Fine Sand (F.S.)	0.25 - 0.10
Very Fine Sand (V.F.S.)	0.10 - 0.05
Silt (Si.)	0.05 - 0.002
Clay (C.)	less than 0.002
Fine Clay (F.C.)	less than 0.0002

Appendix B. (continued)

Proportions of soils separates in various soil textural classes
From: Toogood, J.A. (1958): A simplified textural classification diagram; Canadian Journal of Soil Science, vol. 38, p. 54-55.

Sands are further divided according to the prevalence of differently sized sand fractions. Medium and coarse sands may contain over 25 percent coarse sand but not over 50 percent fine sands. Fine and very fine sands must contain over 50 percent of the res- pective fine sand fractions.

The Soil textural classes are grouped according to the Canada Soil Survey Committee of Canada as follows:

(a) coarse textured sands, loamy sands

(b) moderately coarse textured sandy loam, fine sandy loam

(c) medium textured very fine sandy loam, loam, silt loam, silt

(d) moderately fine textured sandy clay loam, clay loam, silty clay loam (e) fine textured sandy clay, silty clay, clay (40 to 60 percent)

(f) very fine textured heavy clay (more than 60 percent clay)

The particle-size classes for family groupings are as follows:

Fragmental. Stones, cobbles and gravel, with too little fine earth to fill interstices larger than 1 mm.

Sandy-skeletal. Particles coarser than 2 mm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the sandy particle-size class.

Loamy-skeletal. Particles 2 mm to 25 cm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the loamy particle-size class.

Clayey-skeletal. Particles 2 mm to 25 cm occupy 35 percent or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the clayey particle-size class.

Sandy. The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particles 2 mm to 25 cm occupy less than 35 percent by volume.

Loamy. The texture of the fine earth includes loamy very fine sand, very fine sand and finer textures with less than 35 percent clay; particles 2 mm to 25 cm occupy less than 35 percent by volume.

Coarse-loamy. A loamy particle size that has 15 percent or more by weight of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and less than 18 percent clay in the fine earth fraction.

Fine-loamy. A loamy particle size that has 15 percent or more by weight of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and has 18 to 35 percent clay in the fine earth fraction.

Coarse-silty. A loamy particle size that has less than 15 percent of fine sand (0.25 to 0.1 mm) or coarse particles, including fragments up to 7.5 cm and has less than 18 percent clay in the fine earth fraction.

Fine-silty. A loamy particle size that has less than 15 percent of fine sand (0.25 to 0.1 mm) or coarser particles, including fragments up to 7.5 cm and has 18 to 35 percent clay in the fine earth fraction.

Clayey. The fine earth contains 35 percent or more clay by weight and particles 2 mm to 25 cm occupy less than 35 percent by volume.

Fine-clayey. A clayey particle size that has 35 to 60 percent clay in the fine earth fraction.

Very-fine-clayey. A clayey particle size that has 60 percent or more clay in the fine earth fraction.

Soil structure and consistence

Soil structure refers to the aggregation of the primary soil particles into compound particles, or clusters of primary particles, which are separated from adjoining aggregates by surfaces of weakness. The aggregates differ in grade of development (degree of distinctness) and this distinctness is classed as: weak, moderate and strong. The aggregates vary in size and are classed as: very fine, fine, medium, coarse, and very coarse. They also vary in kind; that is, in the character of their faces and edges. The kinds mentioned in this report are: single grain-loose, incoherent mass of individual particles as in sands; blocky-faces rectangular and flattened, vertices sharply angular; subangular blocky-faces subrectangular, vertices mostly oblique or subrounded; columnar-vertical edges near top of columns are not sharp (columns may be flat-topped, round-topped or irregular); granular-spheroidal, characterized by rounded vertices; platy-horizontal planes more or less developed.

Soil consistence comprises the attributes of soil materials that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation and rupture. Consistence reflects the strength and nature of the forces of attraction within a soil mass. The terms used in describing soils in this report are: loose-noncoherent; friable (specifies friable when moist) – a soil material crushes easily under gently to moderate pressure between thumb and forefinger, and coheres when pressed together; firm (specifies firm when moist) – soil material crushes under moderate pressure between thumb and forefinger but resistance is distinctly noticeable; hard

Appendix B. (continued)

(specifies hard when dry) – moderately resistant to pressure, can be broken in the hands without difficulty but rarely breakable between thumb and forefinger; compact-term denotes a combination of firm consistence and a close packing or arrangement of particles; plastic (specifies plastic when wet) – soil material can be formed into wires by rolling between the thumb and forefinger and moderate pressure is required for deformation of the soil mass.

Soil moisture classes

Soil moisture classes are defined according to: (1) actual moisture content in excess of field-moisture capacity, and (2) the extent of the period during which such excess water is present in the plant root zone. The classes are:

(a) rapidly drained soil-moisture content seldom ex ceeds field capacity in any horizon except immediately after water additions;
(b) well-drained soil-moisture content does not normally exceed field capacity in any horizon, except possibly the C, for a significant part of the year;
(c) moderately well-drained soil-moisture in excess of field capacity remains for a small but significant period of the year;
(d) imperfectly drained soil-moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year;
(e) poorly drained soil-moisture in excess of field capacity remains in all horizons for a large part of the year;
(f) very poorly drained free-water remains at or within 30 cm of the surface most of the year.

Special reference to surface drainage may be designated in terms of runoff and described as high, medium, low or ponded. Similarly, specific reference to the characteristics of horizons within the profile may be designated in terms of permeability or percolation and described as rapid, moderate, slow, very slow and none.

Calcareous classes

The Canada Soil Survey Committee (1978) has set the following nomenclature and limits for calcareous grades:

(a) weakly calcareous: 1 to 5 percent calcium carbonate equivalent
(b) moderately calcareous: 6 to 15 percent calcium carbonate equivalent
(c) strongly calcareous: 16 to 25 percent calcium carbonate equivalent
(d) very strongly calcareous: 26 to 40 percent calcium carbonate equivalent
(e) extremely calcareous: greater than 40 percent calcium carbonate equivalent

Reaction classes

The reaction classes and terminology adopted by the Canada Soil Survey Committee (1978) are:

Class	pH(H_2O)
(a) Extremely acid	less than 4.5
(b) Very strongly acid	4.6 to 5.0
(c) Strongly acid	5.1 to 5.5
(d) Medium acid	5.6 to 6.0
(e) Slightly acid	6.1 to 6.5
(f) Neutral	6.6 to 7.3
(g) Mildly alkaline	7.4 to 7.8
(h) Moderately alkaline	7.9 to 8.4
(i) Strongly alkaline	8.5 to 9.0
(j) Very strongly alkaline	9.0

Horizon boundaries

The lower boundary of each horizon is described by indicating its distinctness and form as suggested in the USDA Soil Survey Manual (United States Department of Agriculture, 1951). The classes of distinctness are:

(a) abrupt	less than 2.5 cm wide
(b) clear	2.5 to 6 cm wide
(c) gradual	6 to 12.5 cm wide
(d) diffuse	more than 12.5 cm wide

The categories for form are:

(a) smooth	nearly a plane
(b) wavy	pockets are wider than deep
(c) irregular	pockets are deeper than wide
(d) broken	parts of the horizon are unconnected with other parts

Roots

The terminology for describing roots is that adopted by the Canada Soil Survey Committee (1978). In this system both the abundance and diameter of roots are described. The classes of abundance are:

Abundance	Number per unit area surface
(a) very few	less than 1
(b) few	1 to 3
(c) plentiful	4 to 14
(d) abundant	more than 14

The diameter categories are:

(a) micro	less than 0.075 mm
(b) very fine	0.075 to 1 mm
(c) fine	1 to 2 mm
(d) medium	2 to 5 mm
(e) coarse	more than 5 mm

Appendix B. (continued)

Glossary

This is included to define terms commonly used in soil science: it is not a comprehensive soil glossary.

acid soil – A soil having a pH of less than 7.0.

aggregate – A group of soil particles cohering so as to behave mechanically as a unit.

alkaline soil – A soil having a pH greater than 7.0.

alluvium – A general term for all deposits of modern rivers and streams.

available nutrient – That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants. ("Available" should not be confused with "exchangeable.")

bedrock – The solid rock underlying soils and the regolith or exposed at the surface.

bog – Permanently wet land with low bearing strength.

bulk density, soil – The mass of dry soil per unit bulk volume.

calcareous soil – Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold 0.1N hydrochloric acid.

capability class (soil) – The class indicates the general suitability of the soils for agricultural use. It is a grouping of subclasses that have the same relative degree of limitation or hazard. The limitation or hazard becomes progressively greater from Class 1 to Class 7.

capability subclass (soil) – This is a grouping of soils with similar kinds of limitations and hazards. It provides information on the kind of conservation problem or limitation. The class and subclass together provide the user with information about the degree and kind of limitation for broad land use planning and for the assessment of conservation needs.

category – Any one of the ranks of the system of soil classification in which soils are grouped on the basis of their characteristics.

cation exchange – The interchange between a cation in solution and another cation on the surface of any surface-active material such as clay colloids or organic colloids.

cation-exchange capacity – The sum total of exchangeable cations that a soil can absorb. Sometimes called "total-exchange capacity," "base-exchange capacity," or "cation-adsorption capacity." Expressed in milliequivalents per 100 grams of soil.

classification, soil – The systematic arrangement of soils into categories and classes on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

clay – As a particle-size term; a size fraction .002 mm equivalent diameter.

clayey – Containing large amounts of clay or having properties similar to those of clay.

coarse fragments – Rock or mineral particles 2.0 mm in diameter.

coarse texture – The texture exhibited by sands, loamy sands, and sandy loams except very fine sandy loam. A soil containing large quantities of these textural classes.

consistency – (i) The resistance of a material to deformation or rupture (ii) the degree of cohesion or adhesion of the soil mass.

crust – A surface layer on cultivated soils, ranging in thickness from a few millimeters to as much as 3 cm, that is much more compact, hard and brittle when dry than the material immediately beneath it.

degradation – The changing of a soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated, light colored Ae horizon.

deposit – Material left in a new position by a natural transporting agent such as water, wind, ice, or gravity, or by the activity of man.

eluvial horizon – A soil horizon that has been formed by the process of eluviation. See illuvial horizon.

eolian deposit – Wind deposit; includes both loess and dune sand.

erosion – The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

fertility, soil – The status of a soil with respect to the amount and availability to plants of elements necessary for plant growth.

fertilizer – Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply certain elements essential to the growth of plants.

fertilizer requirements – The quantity of certain plant nutrient elements needed, in addition to the amount supplied by the soil, to increase plant growth to a designated optimum.

fine texture – Consisting of or containing large quantities of the fine fractions, particularly silt and clay.

floodplain – The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

fluvial deposits – All sediments, past and present, deposited by flowing water, including glaciofluvial deposits. Wave-worked deposits and deposits resulting from sheet erosion and mass wasting are not included.

friable – A consistency term pertaining to the ease of crumbling of soils.

frost action – Freezing and thawing of moisture in materials and the resultant effects on these materials and on structures of which they are a part or with which they are in contact.

Appendix B. (continued)

glacial drift – Embraces all rock material transported by glacier ice, glacial meltwater and rafted by icebergs. This term includes till, stratified drift and scattered rock fragments.

glaciofluvial deposits – Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers and kame terraces.

glaciolacustrine deposit – Material deposited in lake water and later exposed either by lowering the water level or by uplift of the land. These sediments range in texture from sands to clays.

gravelly – Containing appreciable or significant amounts of gravel.

green manure – Plant material incorporated with the soil while green, for improving the soil.

ground moraine – Generally an unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice. The predominant material is till, though stratified drift is present in places. The till is thought to have accumulated largely by lodgment beneath the ice but also partly by being let down from the upper surface of the ice through the ablation process. Ground moraine is most commonly in the form of undulating plains with gently sloping swells, sags and enclosed depressions.

groundwater – That portion of the total precipitation that at any particular time is either passing through or standing in the soil and the underlying strata and is free to move under the influence of gravity.

illuvial horizon – A soil layer or horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation.

illuviation – The process of deposition of soil material removed from one horizon to another in the soil; usually from an upper to a lower horizon in the soil profile. Illuviated substances include silicate clay, iron and aluminum hydrous oxides or organic matter.

immature soil – A soil with indistinct or only slightly developed horizons.

infiltration – The downward entry of water into the soil.

landscape – All the natural features such as fields, hills, forests, water, etc., that distinguish one part of the earth's surface from another part. Usually that portion of land or territory that the eye can comprehend in a single view, including all its natural characteristics.

leaching – The removal of materials in solution from the soil.

liquid limit – (upper plastic limit) – (i) The water content corresponding to an arbitrary limit between the liquid and plastic states of consistency of a soil. (ii) The water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

marsh – Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly by sedges, cattails, rushes or other hydrophytic plants. Subclass includes freshwater and salt-water marshes.

mature soil – A soil with well-developed soil horizons produced by the natural processes of soil formation.

medium texture – Intermediate between fine-textured and coarse-textured (soils). (It includes the following textural classes: very fine sandy loam, loam, silt loam and silt).

mineral soil – A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. It contains percent organic matter except for an organic surface layer that may be up to 30 cm thick, if consolidated, or 45 cm if unconsolidated.

mottles – Spots or blotches of different color or shades of color interspersed with the dominant color resulting from reducing conditions.

Munsell color system – A color designation system that specifies the relative degree of the three simple variables of color: hue, value, and chroma. For example: 10YR 6/4 is a color (of soil) with a hue + 10YR, value 6, and chroma 4. These notations can be translated into several different systems of color names as desired.

neutral soil – A soil in which the surface layer, at least to normal plow depth, is neither acid nor alkaline in reaction.

organic soil – A soil that has developed dominantly from organic deposits. The majority of Organic soils are saturated for most of the year, unless artificially drained, but some of them are not usually saturated for more than a few days. They contain 17 percent or more organic carbon and:

1) if the surface layer consists of fibric organic materi al and the bulk density is less than 0.1 (with or without a mesic or humic Op less than 15 cm thick), the organic material must extend to a depth of at least 60 cm; or
2) if the surface layer consists of organic material with a bulk density of 0.1 or more, the organic material must extend to a depth of at least 40 cm; or
3) if a lithic contact occurs at a depth shallower than stated in 1) or 2) above, the organic material must extend to a depth of at least 60 cm.

outwash – Sediments 'washed out' by flowing water in front of the glacier and laid down in beds as

Appendix B. (continued)

stratified drift. Particle size may range from boulders to silt.

parent material – The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil is developed by pedogenic processes.

particle size – The effective diameter of a particle measured by sedimentation, sieving or micrometric methods.

particle size distribution – The amounts of the various soil separates in a soil sample, usually expressed as weight percentages.

peat – Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter.

ped – A unit of soil structure such as a prism, block or granule, formed by natural processes (in contrast with a clod, which is formed artificially).

pedology – Those aspects of soil science involving the constitution, distribution, genesis and classification of soils.

percolation, soil water – The downward movement of water through soil. Especially the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of the order of 1.0 or less.

pH, soil – the negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil as determined by means of a glass, quinhydrone or other suitable electrode or indicator at a specified moisture content or soil-water ratio and expressed in terms of the pH scale.

phase, soil – A subdivision of a soil type or other unit of classification having characteristics that affect the use and management of the soil but which do not vary sufficiently to differentiate it as a separate type. A variation in a property or characteristic such as degree of slope, degree of erosion and content of stones.

physical properties (of soils) – Those characteristics, processes or reactions of a soil which are caused by physical forces and which can be described by, or expressed in, physical terms or equations. Sometimes confused with and difficult to separate from chemical properties; hence, the terms 'physical-chemical' or 'physiochemical' (not used in this report).

plastic limit – (i) The water content corresponding to an arbitrary limit between the plastic and the semisolid states of consistency of a soil. (ii) Water content at which a soil will just begin to crumble when rolled into a thread approximately 3 mm in diameter.

platy – Consisting of soil aggregates that are developed predominately along the horizontal axes; laminated; flaky.

pore space – Total space not occupied by soil particles in a bulk volume of soil.

productivity, soil – The capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management. The "specified" limitations are necessary since no soil can produce all crops with equal success nor can a single system of management produce the same effect on all soils. Productivity emphasizes the capacity of soil to produce crops and should be expressed in terms of yields.

profile, soil – A vertical section of the soil through all its horizons and extending into the parent material.

reaction, soil – The degree of acidity or alkalinity of a soil, usually expressed as a pH value.

saline soil – A nonalkali soil containing soluble salts in such quantities as to interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 mmhos/cm, the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

sand – A soil particle between 0.05 and 2.0 mm in diameter.

silt – A soil particle between 0.05 and 0.002 mm in diameter.

soil – (i) The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (ii) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and microorganisms and topography, all acting over a period of time and producing a product-soil that differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics.

soil conservation – (i) Protection of the soil against physical loss by erosion or against chemical deterioration; that is, excessive loss of fertility by either natural or artificial means. (ii) A combination of all management and land-use methods that safeguard the soil against depletion or deterioration by natural or by man-induced factors.

soil genesis – The mode of origin of the soil with special reference to the processes or soil-forming factors responsible for the development of the solum or true soil, from the unconsolidated parent material.

soil management – The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on or applied to a soil for the production of plants.

soil map – A map showing the distribution of soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

soil moisture – Water contained in the soil.

Appendix B. (continued)

soil morphology – (i) The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness and arrangement of the horizons in the profile and by the textures, structure, consistency and porosity of each horizon. (ii) The structural characteristics of the soil or any of its parts.

soil organic matter – The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by the soil population. Usually determined on soils which have been sieved to pass a 2.0 mm sieve.

soil separates – Mineral particles, <2.0 mm in equivalent diameter, ranging between specified size limits.

soil structure – The combination or arrangement of primary soil particles into secondary particles, units or peds. These secondary units may be, but usually are not, arranged in the profile in such a manner as to give a distinctive characteristic pattern. The secondary units are characterized and classified on the basis of size, shape and degree of distinctness into classes, types and grades, respectively.

soil survey – The systematic examination, description, classification and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

soil texture – The relative proportions of the various soil separates in a soil. The textural classes may be modified by the addition of suitable adjectives when coarse fragments are present in substantial amounts, for example, 'stony silt loam,' or 'silt loam, stony phase.'

solum (plural sola) – The upper horizons of a soil in which the parent material has been modified and within which most plant roots are confined. It consists usually of A and B horizons.

stones – Rock fragments 25 cm in diameter if rounded and 38 cm along the greater axis if flat.

stony – Containing sufficient stones to interfere with or to prevent tillage.

surface soil – The uppermost part of the soil, ordinarily moved in tillage or its equivalent in uncultivated soils and ranging in depth from 8 or 10 cm to 20 or 25 cm. Frequently designated as the 'plow layer,' the 'Ap layer,' or the 'Ap horizon.'

till – (i) Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel and boulders intermingled in any proportion. (ii) To plow and prepare for seeding; to seed or cultivate the soil.

tilth – The physical condition of soil as related to its ease of tillage, fitness as a seedbed and its impedance to seeding emergence and root penetration.

very coarse texture – Consisting of sands and loamy sands.

very fine texture – Consisting of very fine clay particles (more than 60 percent clay.

water logged – Saturated with water.

weathering – The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Appendix C. Map legend

Map unit	Soil group	Landform/parent material	Soil composition
AGPH 2	Angus Ridge	Mostly fine loamy brown till with scattered patches of coarse loamy glaciofluvial veneer of variable thickness; undulating to slightly hummocky.	Mostly well-drained, Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
AGPH 3	Angus Ridge	Mostly fine loamy brown till with scattered patches of coarse loamy glaciofluvial veneer of variable thickness; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained, Black Chernozemics with poorly drained Humic Gleysols in scattered depressions; also includes Gleyed subgroups.
AGPO 2	Angus Ridge	Mostly fine loamy brown till with scattered patches of fine loamy glaciofluvial veneer of variable thickness; undulating to slightly hummocky.	Mostly well-drained, Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
AGS 2	Angus Ridge	Fine loamy brown till; undulating to hummocky.	Mostly well-drained, Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
AGS 3	Angus Ridge	Fine loamy brown till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, Black Chernozemic soils with poorly drained Humic Gleysols in scattered depressions, also includes some Gleyed subgroups.
AGS 7	Angus Ridge	Fine loamy brown till; undulating to hummocky.	Mostly well-drained, Black Chernozemic with Dark Gray Chernozemics and Luvisolic soils.
AGS 8	Angus Ridge	Fine loamy brown till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, Black Chernozemic with Dark Gray Chernozemics and Luvisolic soils with Humic Gleysols in scattered depressions.
AV	Alluvium	Recent deposits of sand, silt, clay and organic matter in stream valleys.	Imperfectly drained Regosols.
BS 1	Beach Sand	Sorted Beach Sand of variable thickness over fine clayey glaciolacustrine; gently sloping.	Poorly drained Rego Gleysols and imperfectly drained Gleyed Regosols.
BS 2	Beach Sand	Sorted Beach Sand, veneer to blanket; undulating.	Rapidly drained Orthic Regosols and imperfectly drained Gleyed Regosols.
BS2D2	Beach Sand	Sorted Beach Sand with numerous wind eroded pits.	Not applicable.

Appendix C. (continued)

Map unit	Soil group	Landform/parent material	Soil composition
CM	Coal Mine	Disturbed lands resulting from surface mining of coal.	Not applicable.
CMO 4	Camrose	Fine loamy brown till; undulating to slightly hummocky.	Mostly well-drained, Black Solonetic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some Gleyed subgroups.
CMO 5	Camrose	Fine loamy brown till; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils with poorly-drained Humic Gleysols in scattered depressions; also includes some Chernozemic soils and Gleyed subgroups.
CMO 6	Camrose	Mostly fine loamy brown till of variable thickness with some gray till at the surface; undulating to slightly hummocky.	Mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some Gleyed subgroups.
CMO 7	Camrose	Mostly fine loamy brown till of variable thickness with some gray till at the surface; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils with poorly-drained Humic Gleysols in scattered depressions; also includes some Chernozemic soils and Gleyed subgroups.
COA 2	Cooking Lake	Fine loamy till; hummocky.	Orthic Gray Luvisols with some Gleyed subgroups.
COA 4	Cooking Lake	Fine loamy till; undulating to hummocky.	Orthic and Dark Gray Luvisols with some Gleyed subgroups.
COA 5	Cooking Lake	Fine loamy till; undulating to hummocky with numerous scattered depressions.	Orthic and Dark Gray Luvisols with poorly drained peaty Gleysols in scattered depressions; also includes some Gleyed subgroups.
COA 6	Cooking Lake	Fine loamy till; undulating to hummocky with numerous scattered depressions.	Orthic Gray Luvisols with poorly drained Typic and Terric Mesisols.
COA 7	Cooking Lake	Fine loamy till; undulating to hummocky with numerous scattered depressions or open peat fens.	Orthic Gray Luvisols with poorly drained Typic and Terric Mesisols.
COA6/W	Cooking Lake	Fine loamy till with scattered patches of washed or partially sorted till; hummocky.	Orthic Gray Luvisols with some Gleyed subgroups.
COA7/W	Cooking Lake	Fine loamy till with scattered patches of washed or partially sorted till; hummocky.	Orthic Gray Luvisols with some Gleyed subgroups.

Appendix C. (continued)

Map unit	Soil group	Landform/parent material	Soil composition
COMY 2	Cooking Lake	Mostly fine loamy till with scattered patches of fine clayey glaciolacustrine veneer of variable thickness; undulating to slightly hummocky.	Orthic Gray Luvisols with some Gleyed subgroups.
COMY 3	Cooking Lake	Mostly fine loamy till with scattered patches of fine clayey glaciolacustrine veneer of variable thickness; undulating to slightly hummocky with numerous scattered depressions.	Mostly Orthic Gray Luvisols with poorly drained peaty Gleysols in scattered depressions; also includes Gleyed subgroups.
CPL 2	Camp Lake	Coarse loamy glaciofluvial outwash; undulating to inclined or terraced.	Well to rapidly drained, Black Chernozemic soils.
CTC0 1	Chatwin-Cooking Lake	Mixture of fine loamy till and peaty organic deposits; undulating to hummocky.	Mixture of Orthic and Gleyed Gray Luvisols with poorly drained Typic and Terric Mesisols.
CTW 1	Chatwin	Peaty organic deposits; undulating.	Typic and Terric Mesisols.
DUG 1	Daugh	Fine clayey glaciolacustrine; level.	Imperfectly drained Black Solonetz soils.
DYD 4	Daysland	Fine loamy brown till; undulating to slightly hummocky.	Mostly well-drained, Black Solods with other Solonetzic and some Chernozemic soils; also includes Gleyed subgroups.
DYD 5	Daysland	Fine loamy brown till; undulating to slightly hummocky; with numerous scattered depressions.	Mostly well-drained, Black Solods with poorly drained Humic Gleysols in scattered depressions. Also includes other Solonetzic and Chernozemic soils and Gleyed subgroups.
EOIR 2	Elnora-Irma	Mostly fine loamy till with scattered patches of coarse loamy, glaciofluvial veneer of variable thickness; hummocky.	Well-drained, Black Chernozemic soils with some Gleyed subgroups.
EOR 1	Elnora	Fine loamy till; undulating to hummocky.	Well-drained, Black Chernozemic soils.
EOR 2	Elnora	Fine loamy till; undulating to hummocky.	Well-drained, Black Chernozemic soils with some Gleyed subgroups.
EOR 3	Elnora	Fine loamy till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, Black Chernozemics with poorly drained Humic Gleysols in scattered depressions. Also includes Gleyed subgroups.

Appendix C. (continued)

Map unit	Soil group	Landform/parent material	Soil composition
EOR 4	Elnora	Fine loamy till; undulating to hummocky.	Mostly well-drained, Black Chernozemic soils with well-drained, Black Solonetzic soils. Also includes Gleyed subgroups.
EOR 5	Elnora	Fine loamy till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, Black Chernozemics with well-drained, Black Solonetzic soils and poorly drained Humic Gleysols in scattered depressions. Also includes Gleyed subgroups.
EOR 10	Elnora	Fine loamy till; undulating to hummocky.	Mostly well-drained, Black Chernozemics with Rego and thin profiles in upper slope positions.
GBY 2	Gadsby	Fine clayey glaciolacustrine veneer; level.	Well-drained, Black Solodized Solenetzic soils with some Gleyed subgroups.
GP	Gravel Pit	Disturbed lands resulting from surface mining of gravel.	Not applicable.
HEIM 4	Heisler-Irma	Mostly fine loamy brown till with scattered patches of coarse loamy glaciofluvial veneer of variable thickness; undulating to slightly hummocky.	Mostly well-drained, Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
HER 2	Heisler	Fine loamy brown till; undulating to hummocky.	Mostly well-drained, thin Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
HER 3	Heisler	Fine loamy brown till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, thin Black Chernozemic soils with poorly drained Humic Gleysols in scattered depressions, also includes some Gleyed subgroups.
HER 4	Heisler	Fine loamy brown till; undulating to hummocky.	Mostly well-drained, thin Black Chernozemics with well-drained Black Solonetzic soils. Includes some Gleyed subgroups.
HER 5	Heisler	Fine loamy brown till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained, thin Black Chernozemics with well-drained Black Solonetzic soils and poorly drained Humic Gleysols; includes some Gleyed subgroups.
HGT 1	Haight	Fine clayey glaciolacustrine; level.	Poorly drained Humic Gleysols.
HGT 2	Haight	Fine clayey glaciolacustrine veneer of variable thickness with some till at the surface; undulating.	Poorly drained Humic Gleysols with some well and imperfectly drained Black Solonetzic and Chernozemic soils and some saline soils.

Appendix C. (continued)

Map unit	Soil group	Landform/parent material	Soil composition
HGT 3	Haight	Fine clayey glaciolacustrine veneer; mapped in sinuous meltwater channels.	Poorly drained Humic Gleysols with some well and imperfectly drained Black Solonetzic and Chernozemic soils and some saline soils.
IRM 2	Irma	Coarse loamy glaciofluvial veneer to blanket; undulating to slightly hummocky.	Well to rapidly drained thin Black Chernozemic soils with some imperfectly drained subgroups.
KLM 4	Killam	Fine loamy brown till; undulating to slightly hummocky.	Mostly well-drained thin Black Solonetzic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some imperfectly drained subgroups.
KLM 5	Killam	Fine loamy brown till; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained thin Black Solonetzic (Solodized Solonetz and Solod) soils with poorly drained Humic Gleysols in scattered depressions. Also includes some Chernozemic soils and Gleyed subgroups.
KLM 6	Killam	Mostly fine loamy brown till of variable thickness with some gray till at the surface; undulating to slightly hummocky.	Mostly well-drained thin Black Solonetzic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some imperfectly drained subgroups.
KLM 7	Killam	Mostly fine loamy brown till of variable thickness with some gray till at the surface; undulating to slightly hummocky with numerous scattered depressions.	Mostly well-drained thin Black Solonetzic (Solodized Solonetz and Solod) soils with poorly drained Humic Gleysols in scattered depressions. Also includes some Chernozemic soils and Gleyed subgroups.
KNA 1	Kinsella	Coarse loamy to gravelly glaciolacustrine; undulating to inclined and terraced.	Rapidly drained Black Chernozemic soils.
LB 4	LB	Recent deposits of silty to clayey lacustrine material; level.	A mixture of poorly-drained Rego Gleysols and imperfectly drained Gleyed Regosols.
LTUN 2	Leith-Uncas	Coarse loamy to glaciofluvial veneer of variable thickness with some till at the surface.	Mostly Dark Gray Luvisols with some Gleyed subgroups.
MCMW 2	Macola	Fine clayey glaciolacustrine veneer to blanket; undulating.	A mixture of Dark Gray and Orthic Gray Luvisols with some Gleyed subgroups.
MCMW 3	Macola	Fine clayey glaciolacustrine veneer to blanket; slightly hummocky.	A mixture of Dark Gray and Orthic Gray Luvisols with peaty Gleysols in scattered depressions. Some Gleyed subgroups.

Appendix C. (continued)

Map unit	Soil group	Landform/parent material	Soil composition
NRM 4	Norma	Fine loamy brown till; undulating to hummocky.	Mostly well-drained Solonetzic Black Chenozemic soils with Black Solonetzic soils. Includes some Gleyed subgroups.
NRM 5	Norma	Fine loamy brown till; undulating to hummocky with numerous scattered depressions.	Mostly well-drained Black Chernozemics with well-drained Black Solonetzic soils and poorly drained Humic Gleysols.
PHS 2	Peace Hills	Coarse loamy glaciofluvial veneer to blanket; undulating to slightly hummocky.	Well to rapidly drained Black Chernozemic soils with some imperfectly drained subgroups.
POK 2	Ponoka	Fine loamy glaciofluvial veneer to blanket; undulating.	Mostly well-drained Black Chernozemic soils but including some Gleyed subgroups and Humic Gleysols.
RB 1	Rough Broken	Undifferentiated steeply sloping land with a thin and discontinuous veneer of till over bedrock; inclined.	Undifferentiated black grassland soils.
RB 3	Rough Broken	Undifferentiated steeply sloping land with a thin and discontinuous veneer of till over bedrock. Includes valley bottom.	Undifferentiated black grassland soils with poorly drained Gleysols in valley bottom.
SHS 4	Shonts	Fine loamy gray till of variable thickness over bedrock; level to undulating.	Mostly well-drained, thin Black Solonetzic (Solodized Solonetz and Solod) soils but including some Chernozemic soils and some imperfectly drained subgroups.
SHS 5	Shonts	Fine loamy gray till of variable thickness over bedrock; level to undulating with numerous scattered depressions.	Mostly well-drained, thin Black Solonetzic (Solodized Solonetz and Solod) soils with poorly drained Humic Gleysols in scattered depressions. Also includes some Chernozemic soils and Gleyed subgroups.
TOA 4	Thomas Lake	Fine clayey glaciolacustrine veneer to blanket; level to slightly undulating.	Well-drained, thin Black Chernozemic soils and some imperfectly drained subgroups.
TOA 5	Thomas Lake	Fine clayey glaciolacustrine veneer to blanket; level to slightly undulating with numerous scattered depressions.	Well-drained, thin Black Chernozemic soils with poorly drained Humic Gleysols in scattered depressions.
UNC 5	Uncas	Fine loamy till; undulating to hummocky.	Well-drained, Dark Gray and Orthic Gray Luvisols with some Gleyed subgroups.
UNC 6	Uncas	Fine loamy till; hummocky.	Well-drained, Dark Gray and Orthic Gray Luvisols with peaty Gleysols in scattered depressions. Some imperfectly drained subgroups.

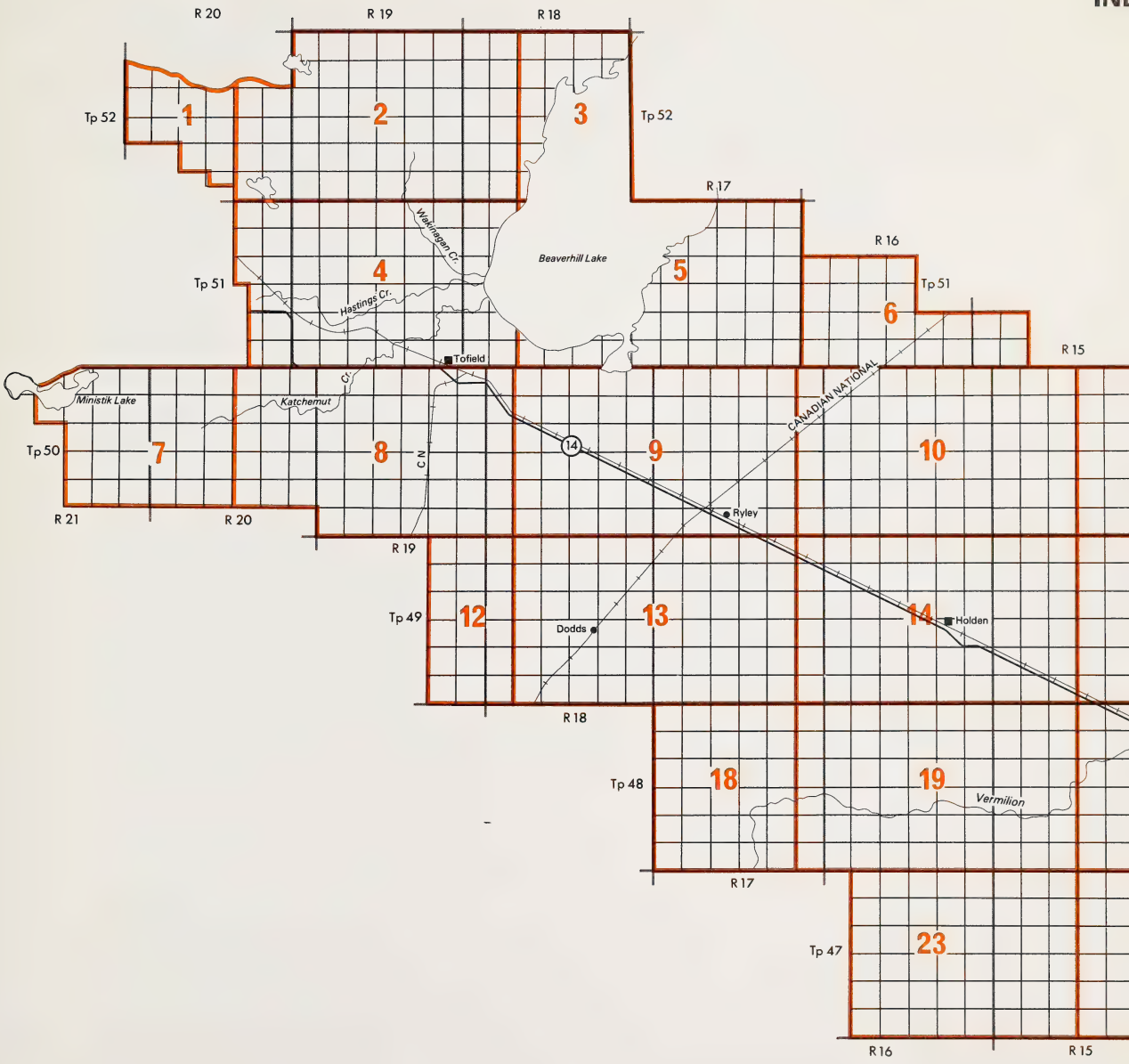
Appendix D. Locations of information pertaining to soils and soil units of the County of Beaver.

Map unit	Page numbers on which data is presented for: Soil descriptions	Unit descriptions	Interpretations for: agriculture capability	erodibility	Engineering properties
AGPH 2	13	13	29	31	-
AGPH 3	13	13	29	31	-
AGPO 2	13	13	29	31	-
AGS 2	13	13	29	31	33
AGS 3	13	13	29	31	33
AGS 7	13	13	29	31	33
AGS 8	13	13	29	31	33
AV	24	-	29	31	-
BS 1	24	24	29	31	-
BS 2	24	24	29	31	-
BS2D 2	24	24	29	31	-
CM	24	-	29	31	-
CMO 4	14	14	29	31	33
CMO 5	14	14	29	31	33
CMO 6	14	14	29	31	33
CMO 7	14	14	29	31	33
COA 2	15	15	29	31	33
COA 4	15	15	29	31	33
COA 5	15	15	29	31	33
COA 6	15	16	29	31	33
COA 7	15	16	29	31	33
COA6/W	15	16	29	31	33
COA7/W	15	16	29	31	33
COMY 2	15	16	29	31	-
COMY 3	15	16	29	31	-
CPL 2	14	14	29	31	-
CTCO 1	15	15	29	31	-
CTW 1	15	15	29	31	-
DUG 1	17	17	29	31	-
DYD 4	16	16	29	31	-
DYD 5	16	17	29	31	-
EOIR 2	17	17	29	31	-
EOR 1	17	17	29	31	-
EOR 2	17	17	29	31	-
EOR 3	17	18	29	31	-
EOR 4	17	18	30	31	-
EOR 5	17	18	30	31	-
EOR 10	17	18	30	31	-
GBY 2	18	18	30	31	-
GP	24	-	30	32	-
HEIM 4	18	19	30	32	-
HER 2	18	19	30	32	-
HER 3	18	19	30	32	-
HER 4	18	19	30	32	-
HER 5	18	19	30	32	-
HGT 1	19	19	30	32	-
HGT 2	19	19	30	32	-
HGT 3	19	19	30	32	-
IRM 2	20	20	30	32	-
KLM 4	20	20	30	32	33
KLM 5	20	20	30	32	33
KLM 6	20	20	30	32	33
KLM 7	20	20	30	32	33

Appendix D. (continued)

Map unit	Page numbers on which data is presented for: Soil descriptions	Unit descriptions	Interpretations for: agriculture capability	erodibility	Engineering properties
KNA 1	21	21	30	32	-
LB 4	25	25	30	32	-
LTUN 2	21	21	30	32	-
MCMW 2	21	21	30	32	33
MCMW3	21	21	30	32	33
NRM 4	22	22	30	32	-
NRM 5	22	22	30	32	-
PHS 2	22	22	30	32	33
POK 2	22	23	30	32	33
RB 1	25	25	30	32	-
RB 3	25	25	30	32	-
SHS 4	23	23	30	32	-
SHS 5	23	23	30	32	-
TOA 4	23	23	30	32	-
TOA 5	23	23	30	32	-
UNC 5	24	24	30	32	34
UNC 6	24	24	30	32	34

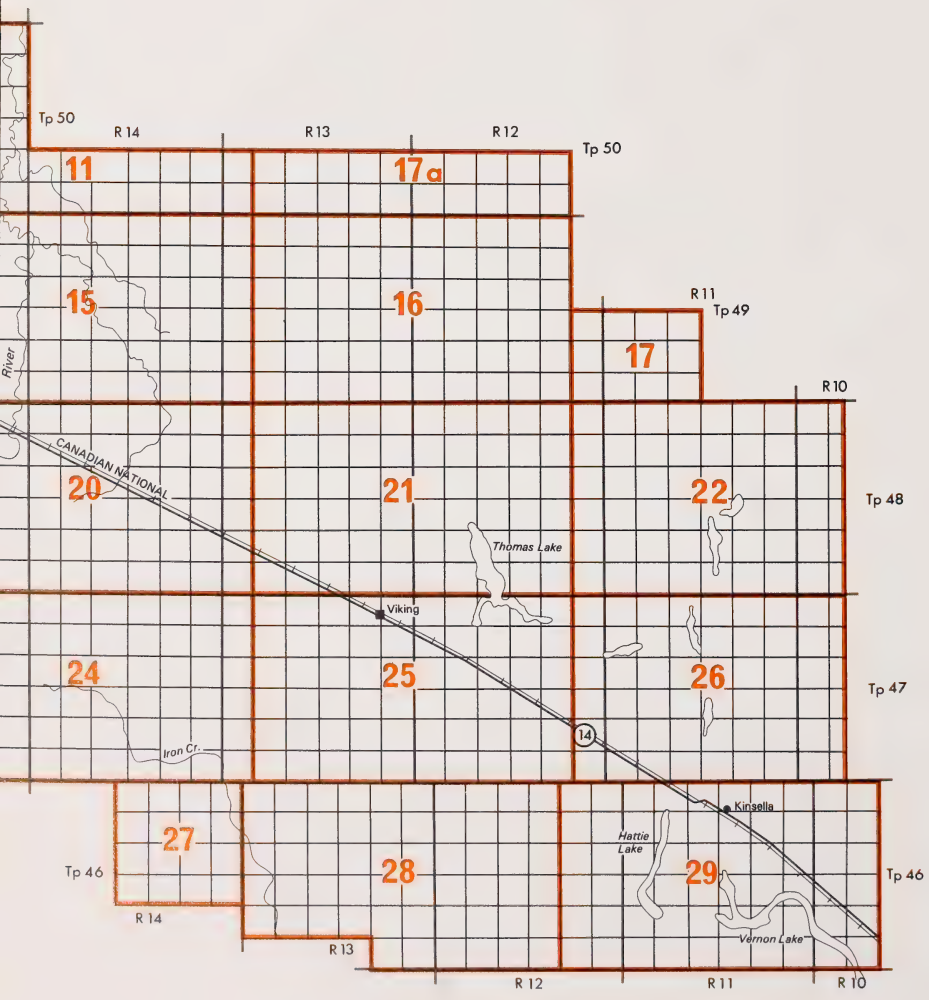
Appendix E. Soil maps.


R 20
R 19
R 18
R 17
R 16
R 15
Tp 52
Tp 51
Tp 50
Tp 49
Tp 48
Tp 47
1
2
3
4
5
6
7
8
9
10
12
13
14
18
19
23
Wakinagan Cr.
Beaverhill Lake
Hastings Cr.
Tofield
Ministik Lake
Katchemut Cr.
C N
CANADIAN NATIONAL
14
Ryley
Dodds
Holden
Vermilion
R 21

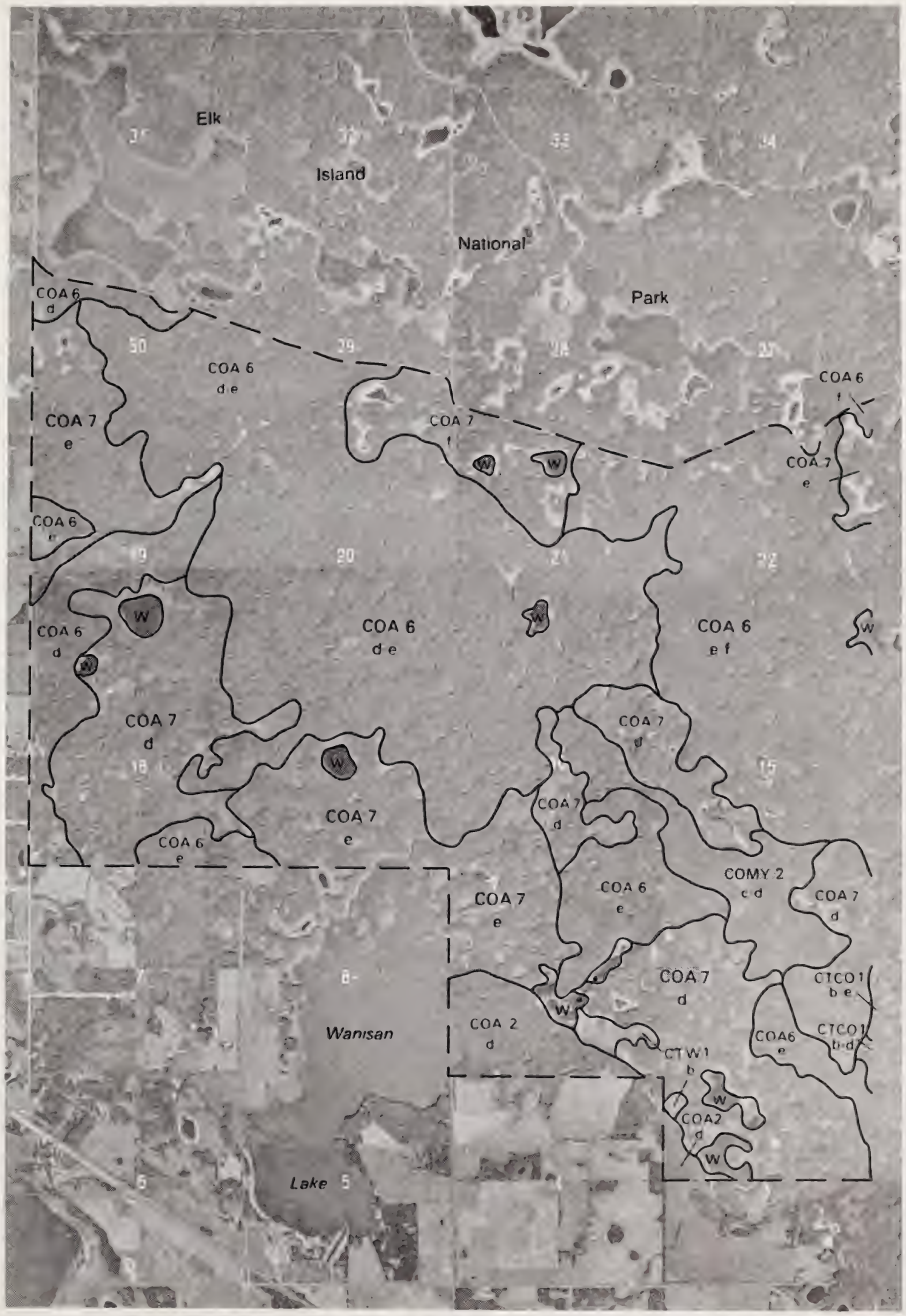
DEX TO MAP SHEETS

TOWNSHIP PLAN

31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1



R 20 W4M



Tp 52

Joins sheet 2

Tp 52

Soil Survey - County of Beaver - Mosaic No.1

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

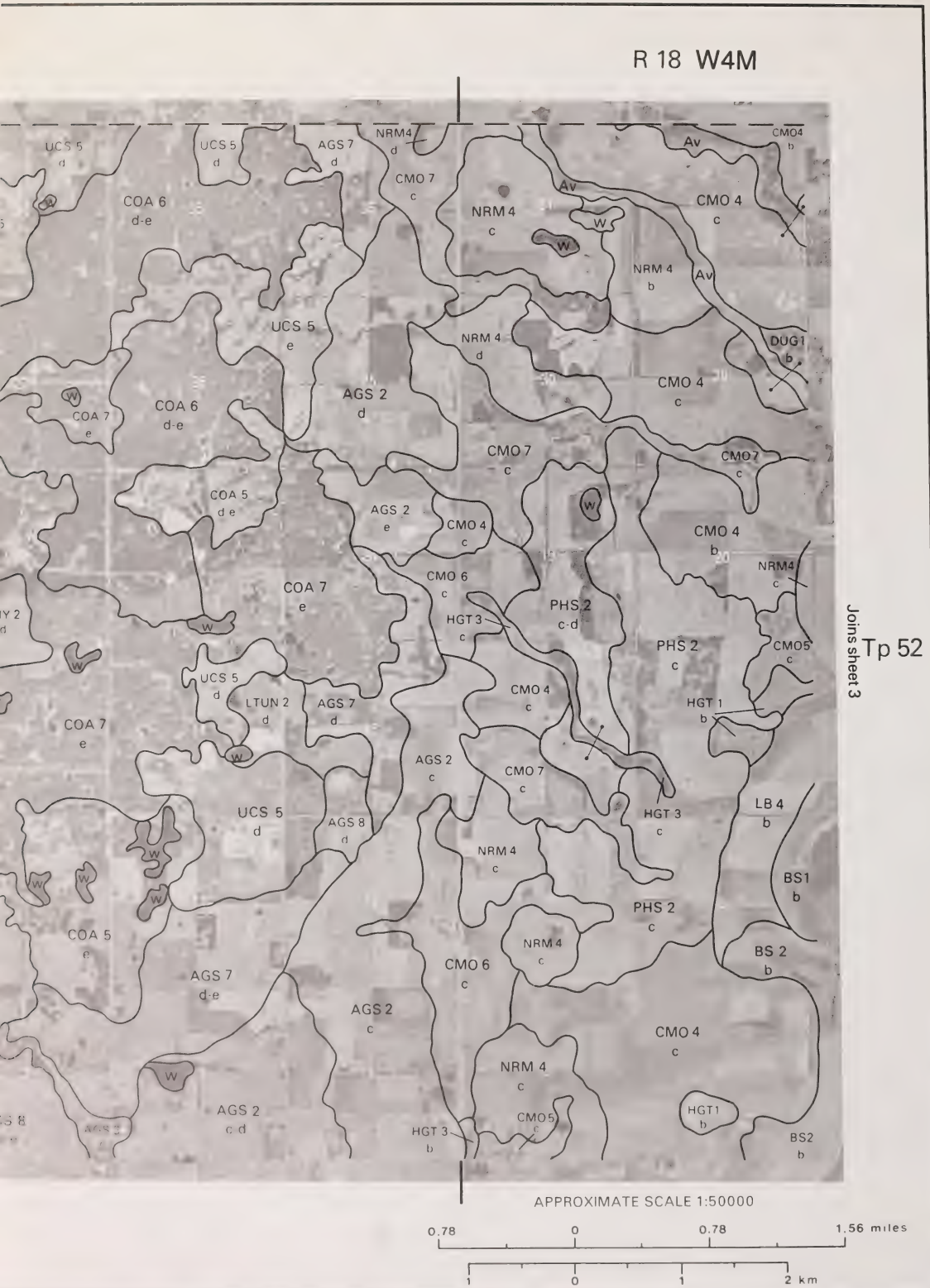
R 20 R 19

Tp 52

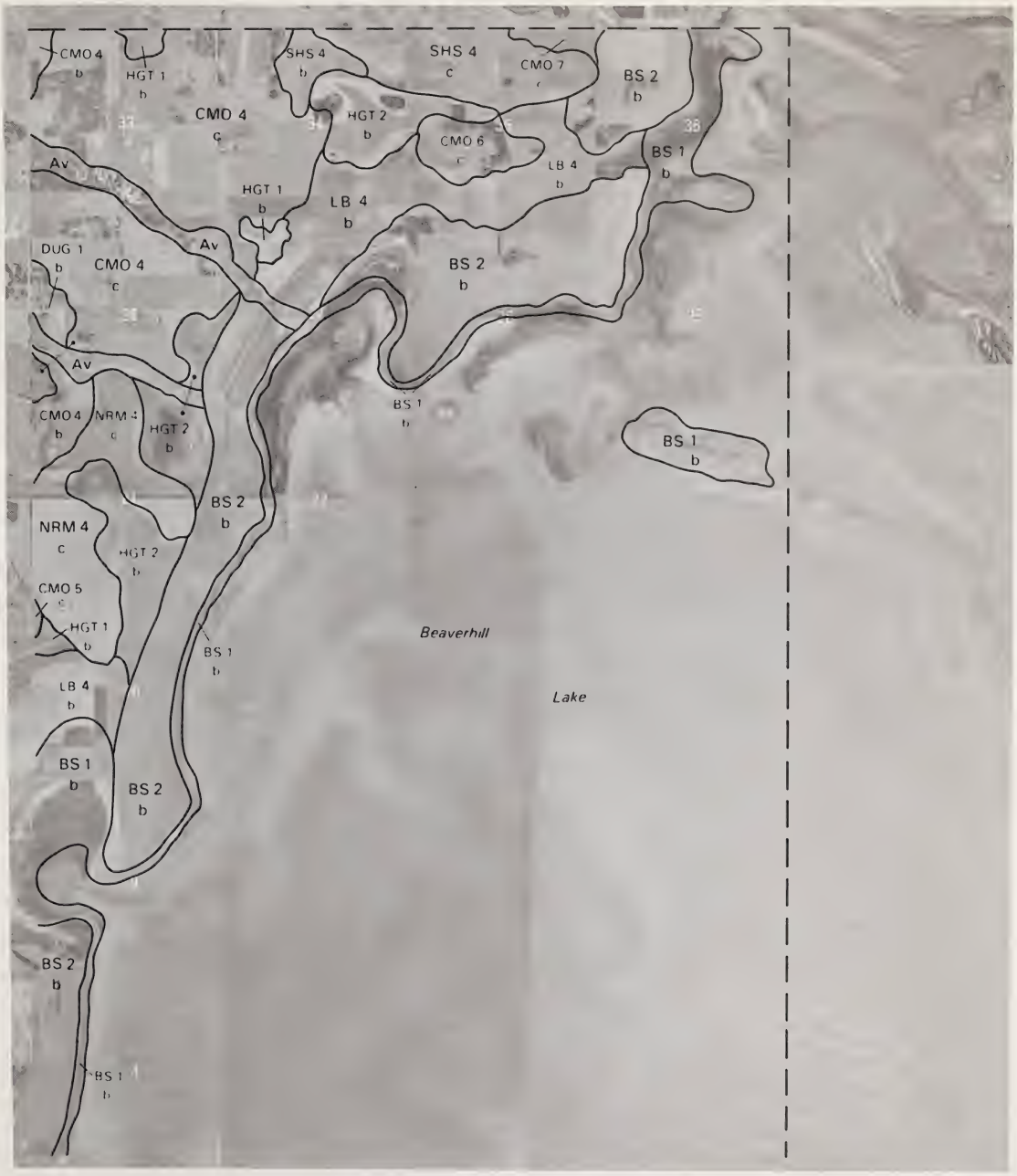
Joins sheet 1

R 20 R 19

Soil Survey - County of Beaver - Mosaic - No.2


R 18 W4M
Joins sheet 3
Tp 52
UCS 5 d
UCS 5 d
AGS 7 d
NRM4 d
CMO 7 c
Av
CMO4 b
COA 6 d-e
NRM 4 c
CMO 4 c
NRM 4 b
Av
UCS 5 e
NRM 4 d
DUG1 b
AGS 2 d
CMO 4 c
COA 7 e
COA 6 d-e
CMO 7 c
CMO7 c
COA 5 d e
AGS 2 e
CMO 4 c
CMO 4 b
NRM4 c
CMO 6 c
COA 7 e
PHS 2 c-d
HGT 3 c
PHS 2 c
CMO5 c
UCS 5 d
LTUN 2 d
AGS 7 d
CMO 4 c
HGT 1 b
COA 7 e
AGS 2 c
CMO 7 c
UCS 5 d
AGS 8 d
HGT 3 c
LB 4 b
NRM 4 c
BS1 b
PHS 2 c
COA 5 e
NRM 4 c
BS 2 b
AGS 7 d-e
CMO 6 c
AGS 2 c
CMO 4 c
NRM 4 c
AGS 2 c d
HGT 3 b
CMO5 c
HGT1 b
BS2 b
APPROXIMATE SCALE 1:50000
0.78 0 0.78 1.56 miles
1 0 1 2 km

R 18 W4M



Tp 52

Joins sheet 2

Tp

R 18

APPROXIMATE SCALE 1:50000

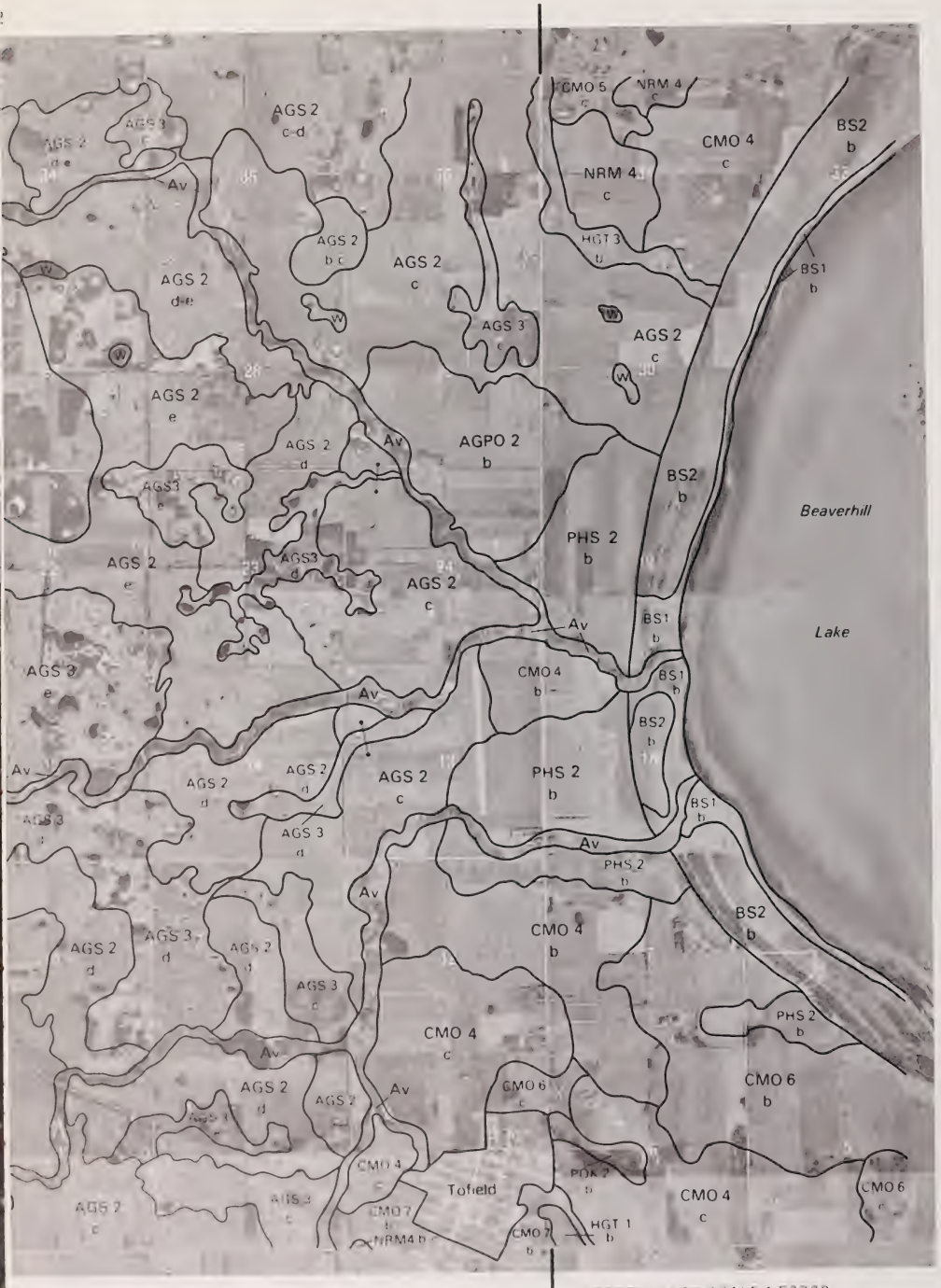
0.78 0 0.78 1.56 mi

1 0 1 2 km

Soil Survey - County of Beaver - Mosaic No.3

Soil Survey - County of Beaver - Mosaic - No.4

R 18 **W4M**



Tp 51

Joins sheet 5

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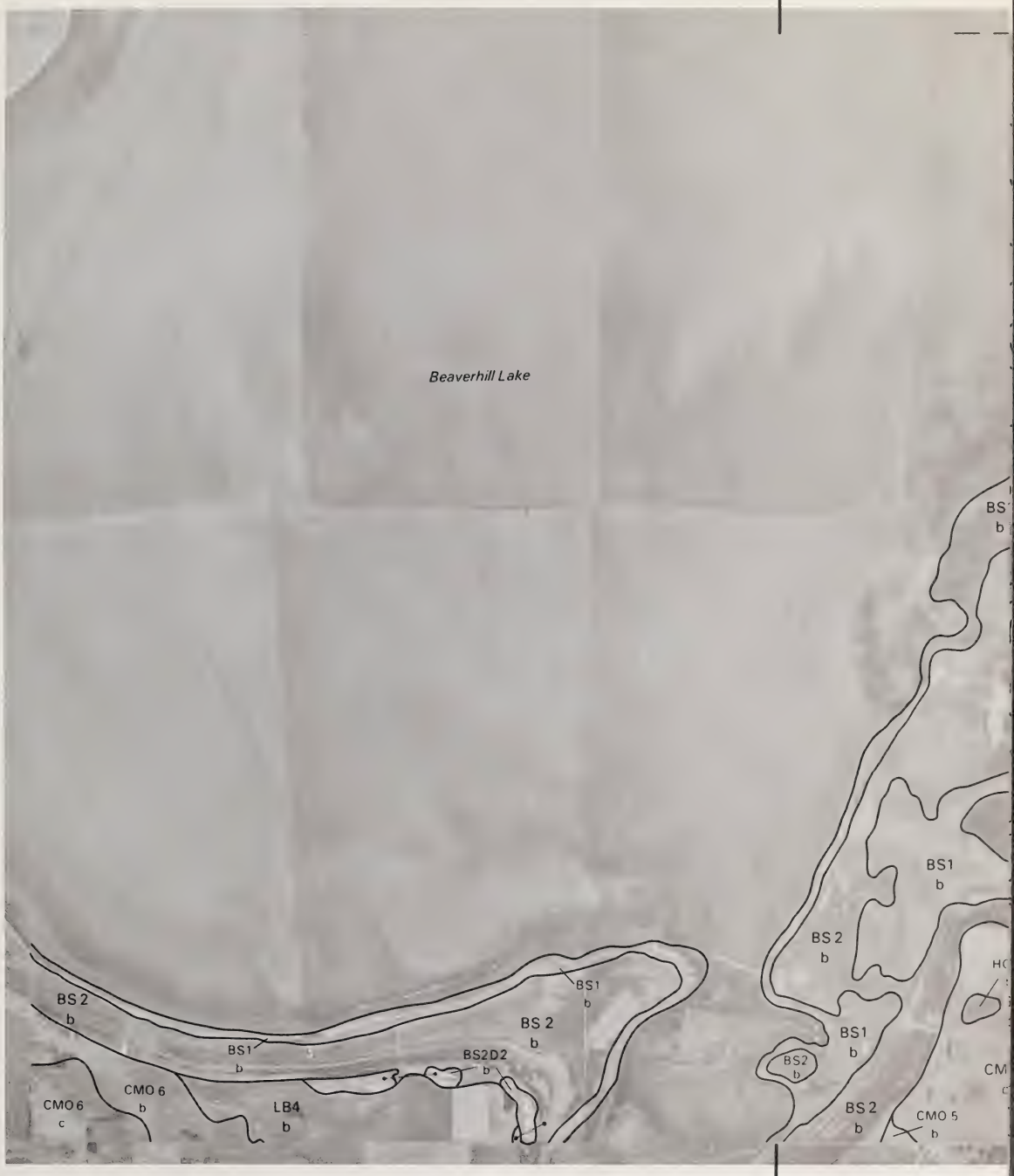
1 0 1 2 km

R 18

Tp 51



R 18

Soil Survey - County of Beaver - Mosaic No.5

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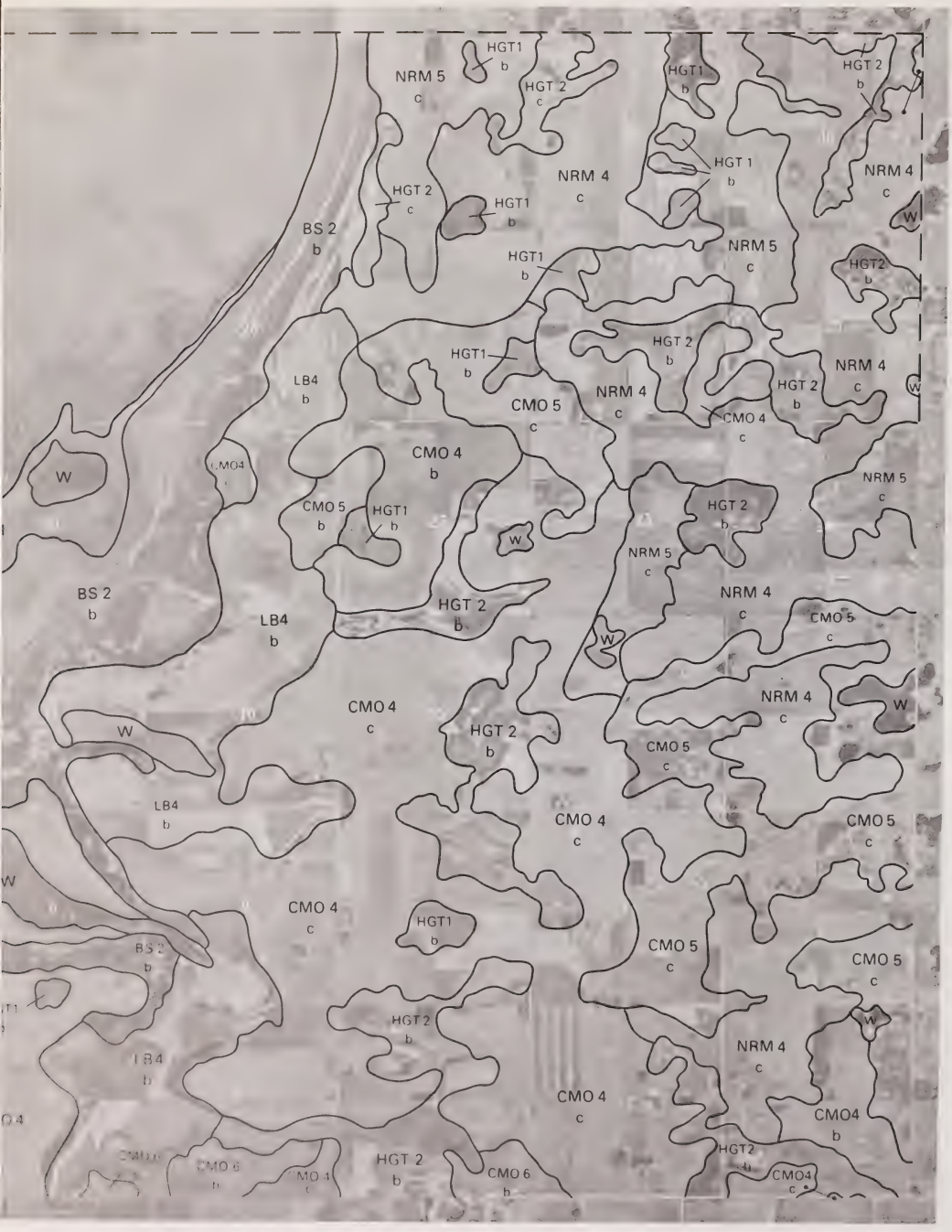


Joins sheet 6

Tp 51

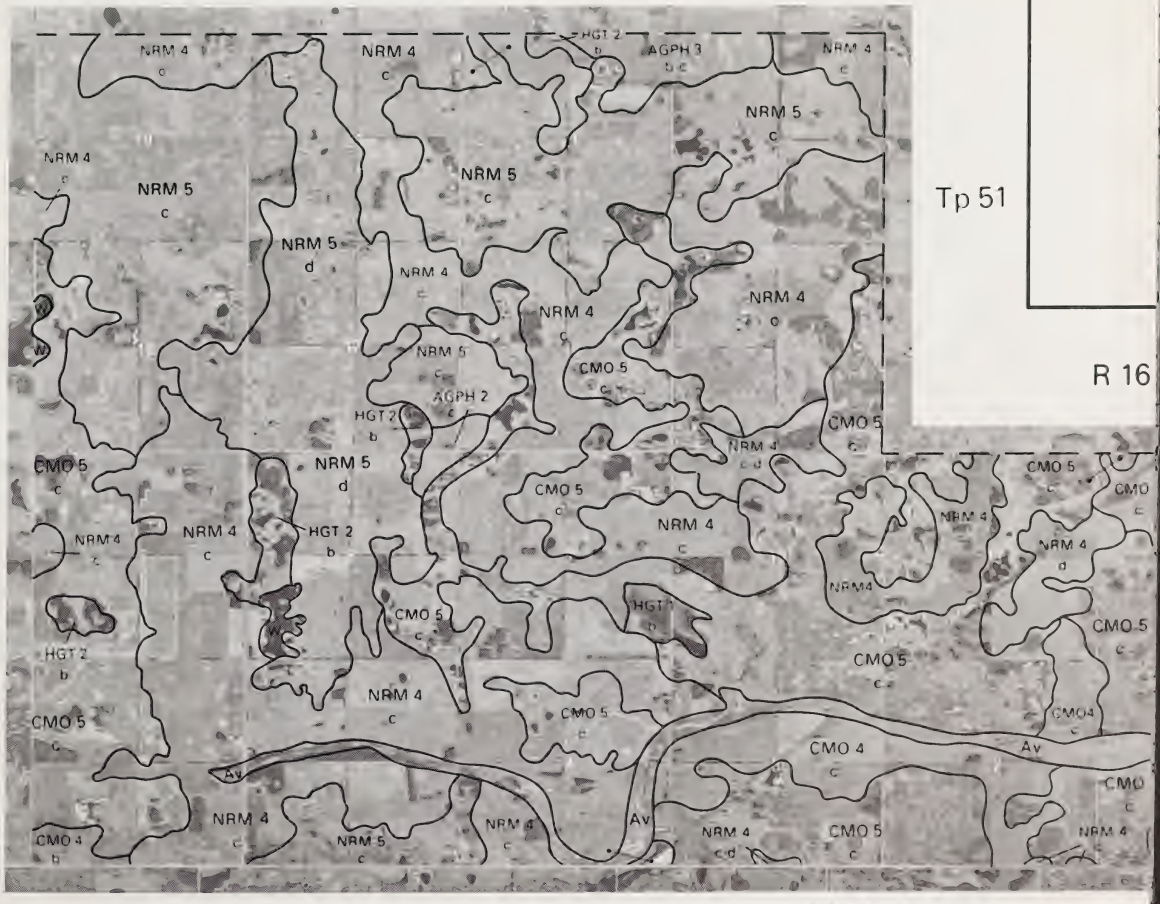
APPROXIMATE SCALE 1:50000

R 17

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 16



Tp 51

R 16

Tp 51

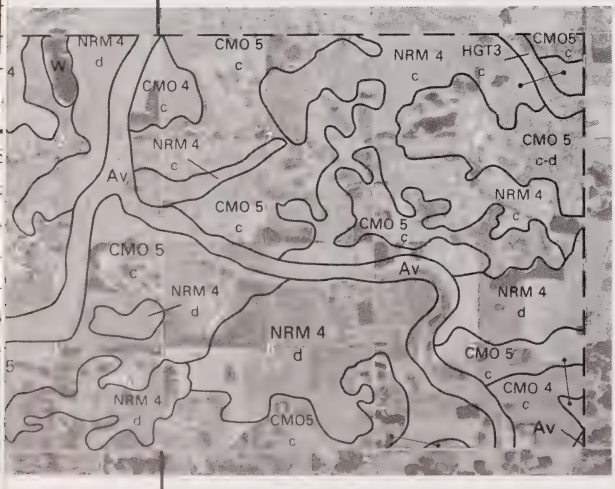
Joins sheet 5

Joins sheet 10

R 16

Soil Survey - County of Beaver - Mosaic - No.6

R 15 **W4M**



Tp 51

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

Soil Survey - County of Beaver - Mosaic No.7

R 20 W4M

Joins sheet 8

Tp 50

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 20

Tp 50

Joins sheet 7

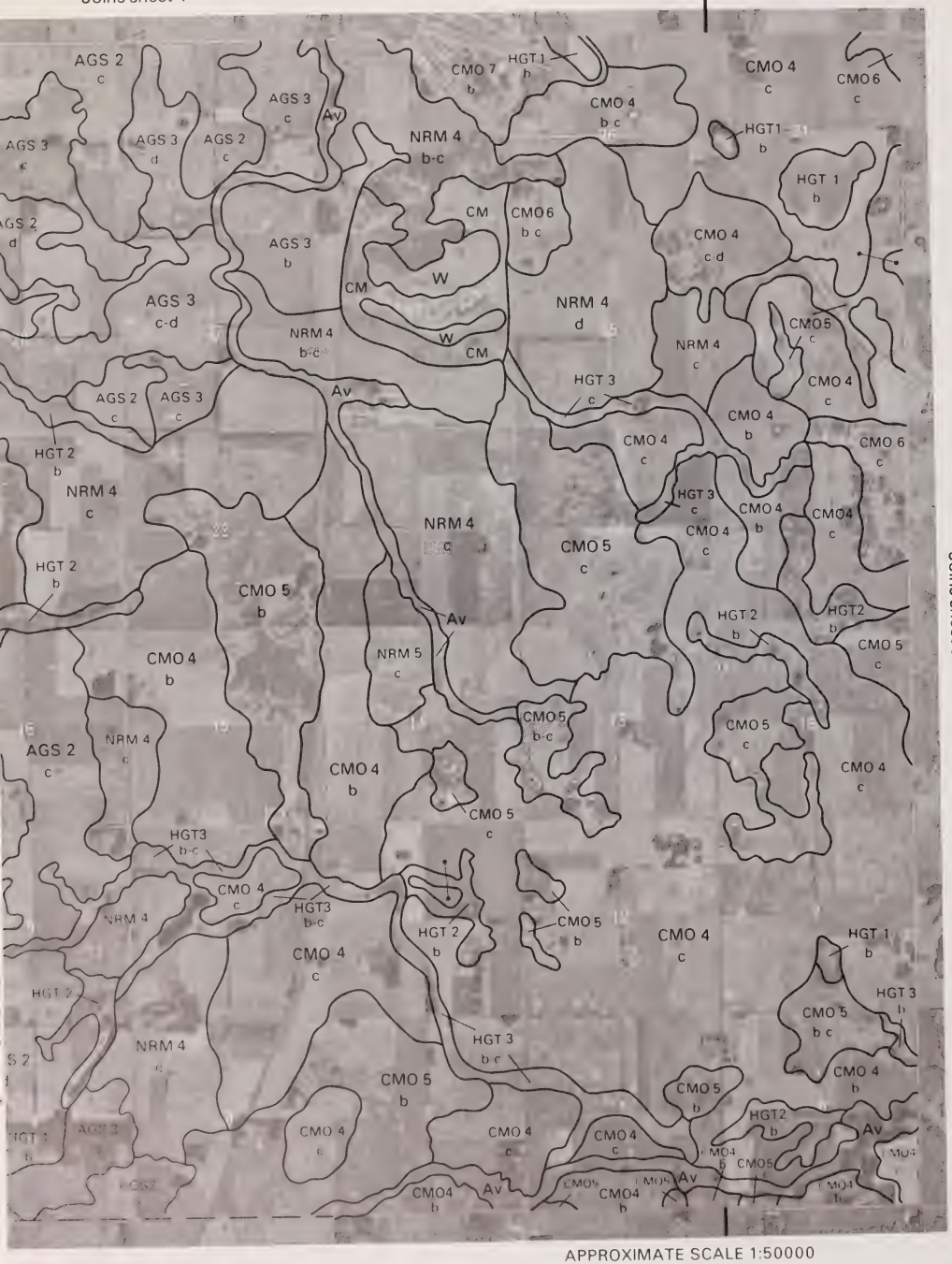
R 20

Soil Survey - County of Beaver - Mosaic - No.8

R 19

Joins sheet 4

R 18 W4M



Joins sheet 9

Tp 50

APPROXIMATE SCALE 1:50000

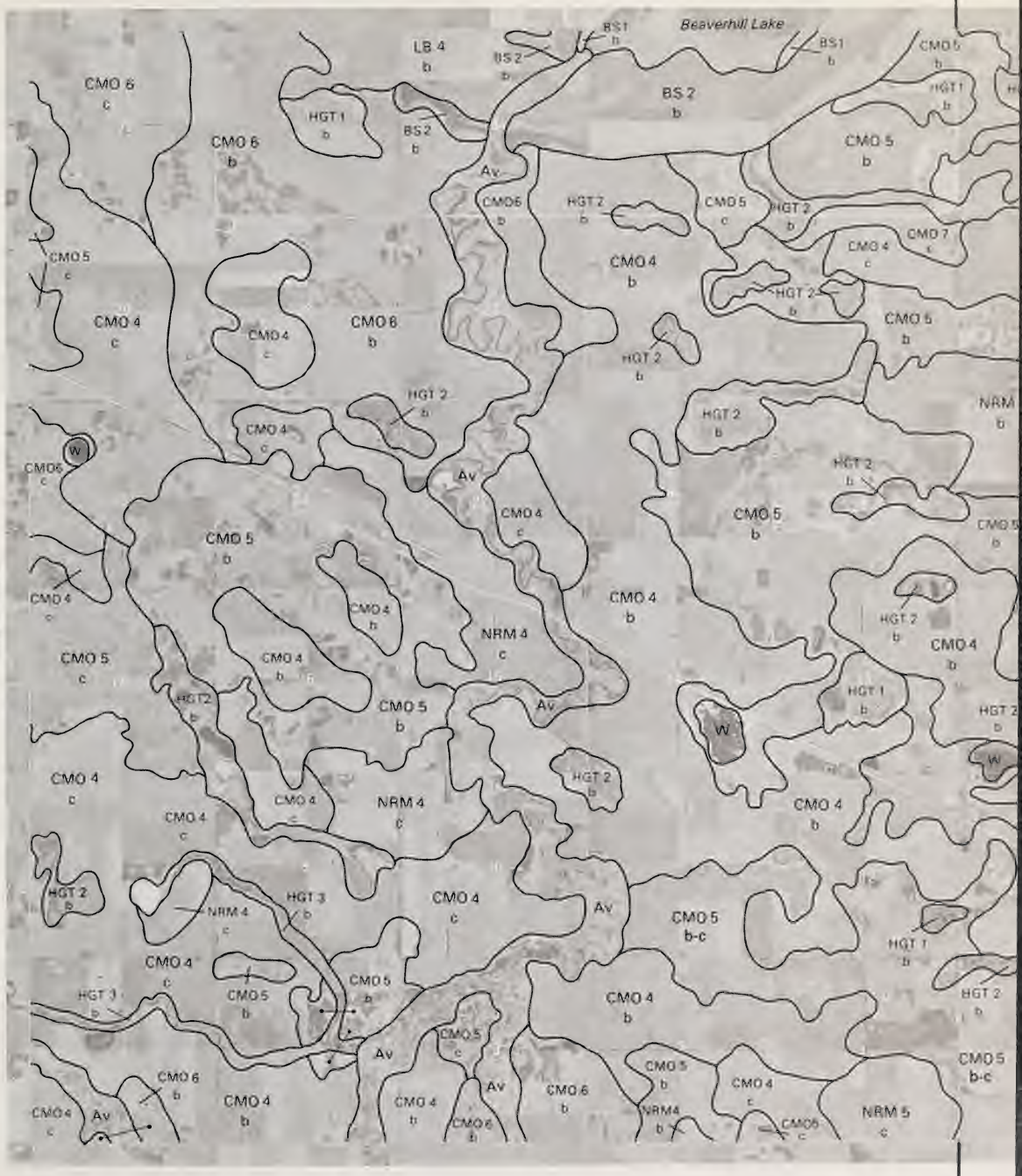
R 19

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 18

Joins sheet 5



Tp 50

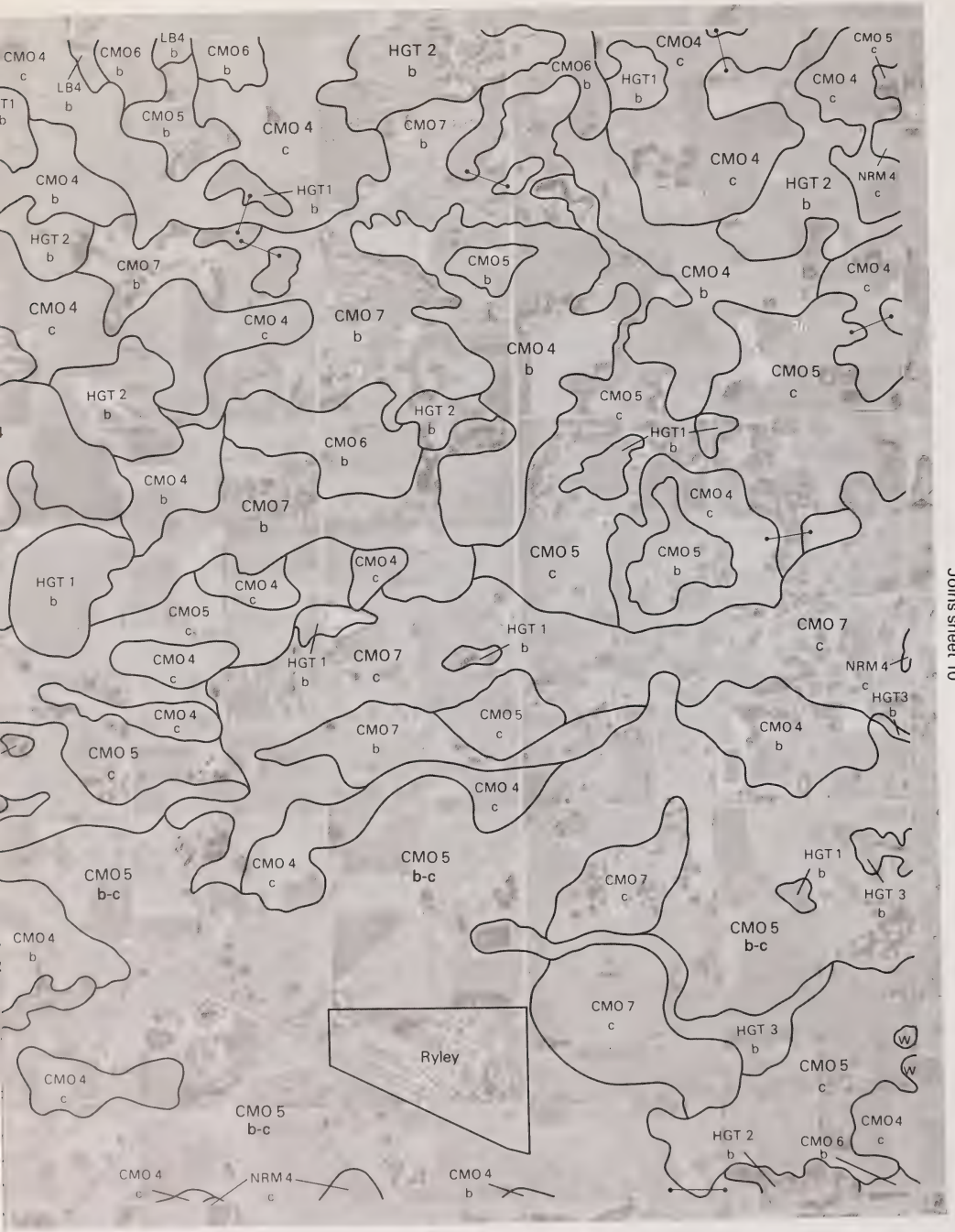
Joins sheet 8

R 18

Joins sheet 13

Soil Survey - County of Beaver - Mosaic No.9

R 17 **W4M**



Joins sheet 10 Tp 50

APPROXIMATE SCALE 1:50000

R 17

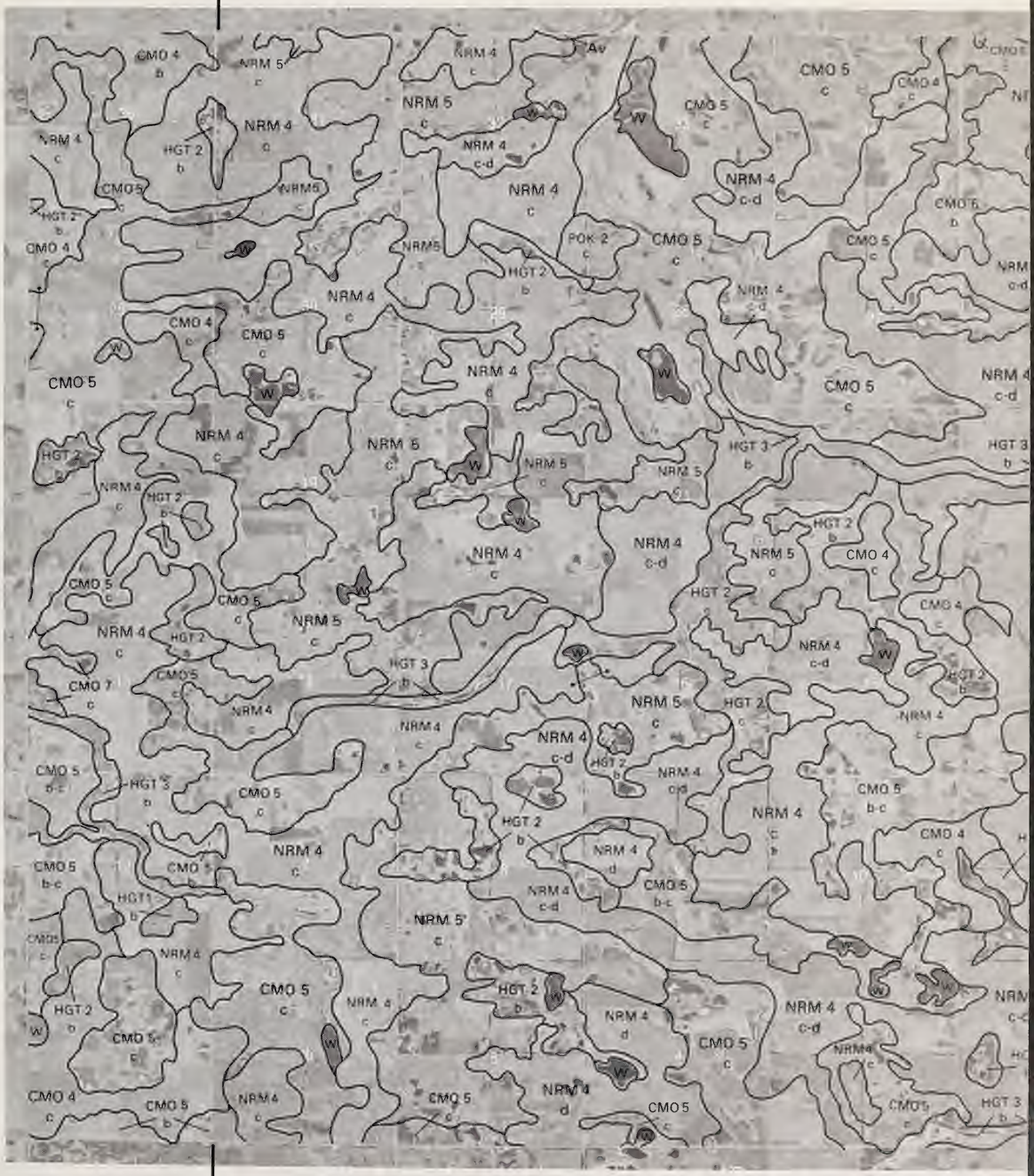
0.78 0 0.78 1.56 miles

1 0 1 2 km

R 17

R 16

Joins sheet 6



Tp 50

Joins sheet 9

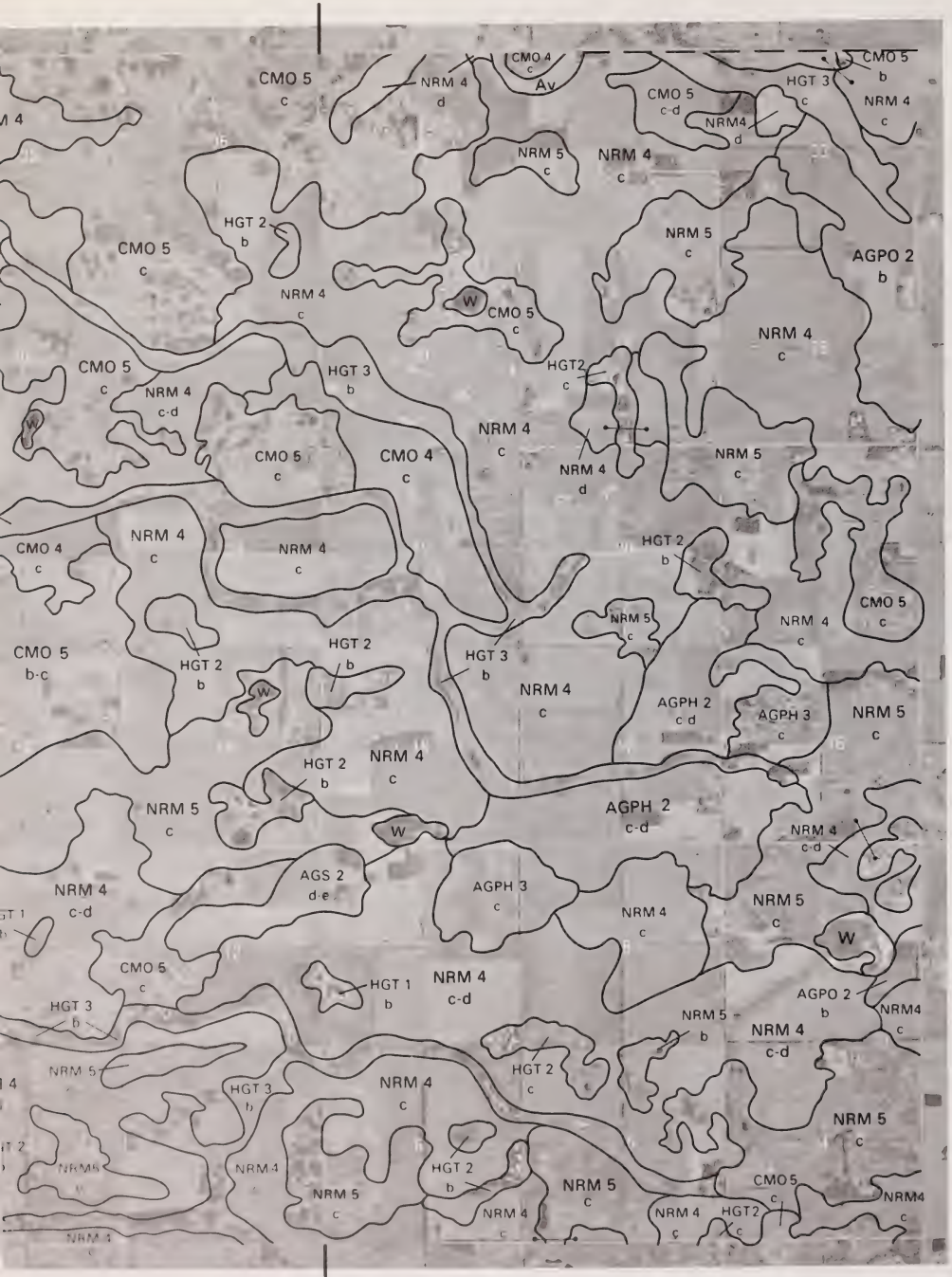
Joins sheet 14

R 17

R 16

Soil Survey - County of Beaver - Mosaic - No.10

R 15 W4M



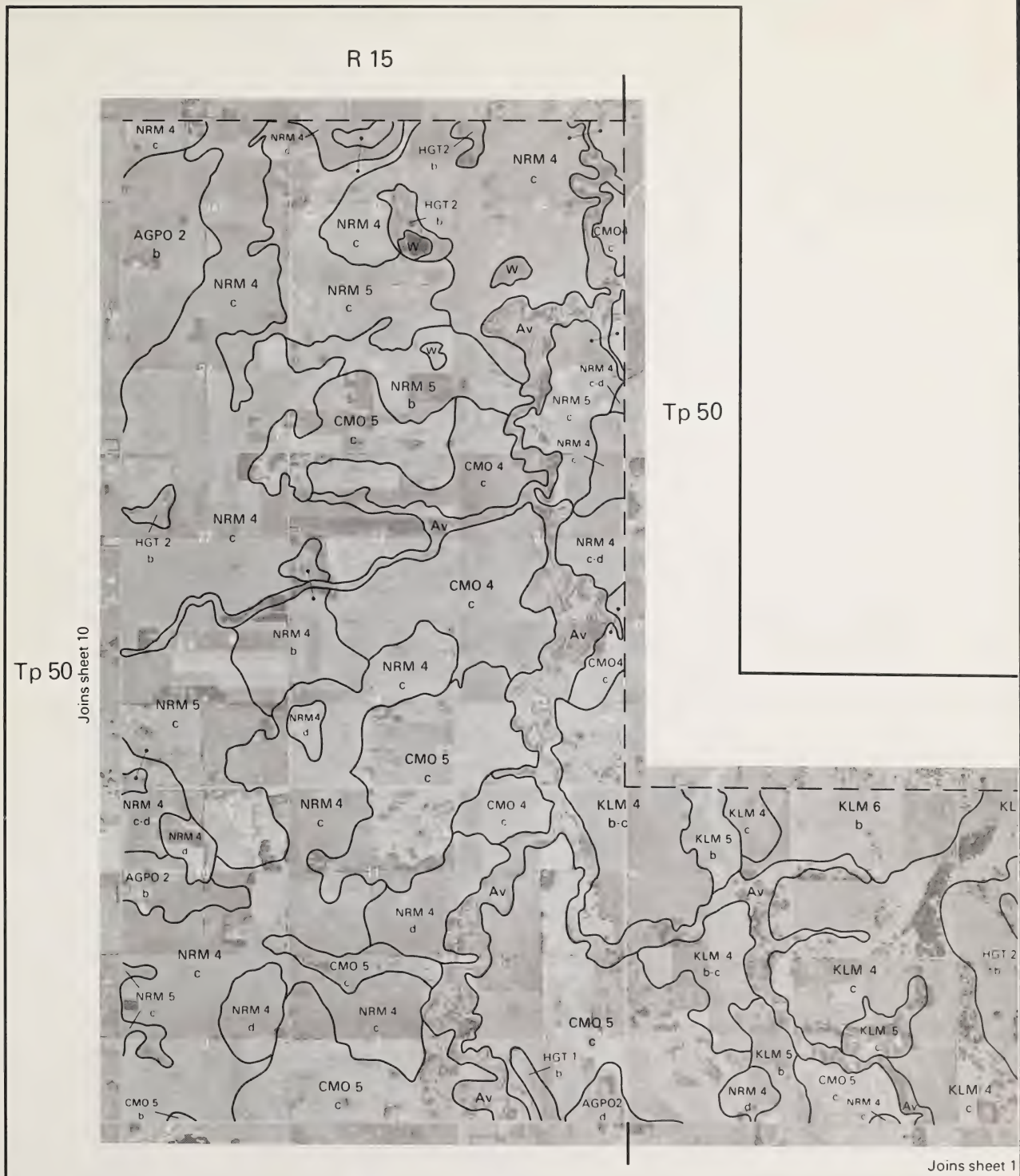
Joins sheet 11

Tp 50

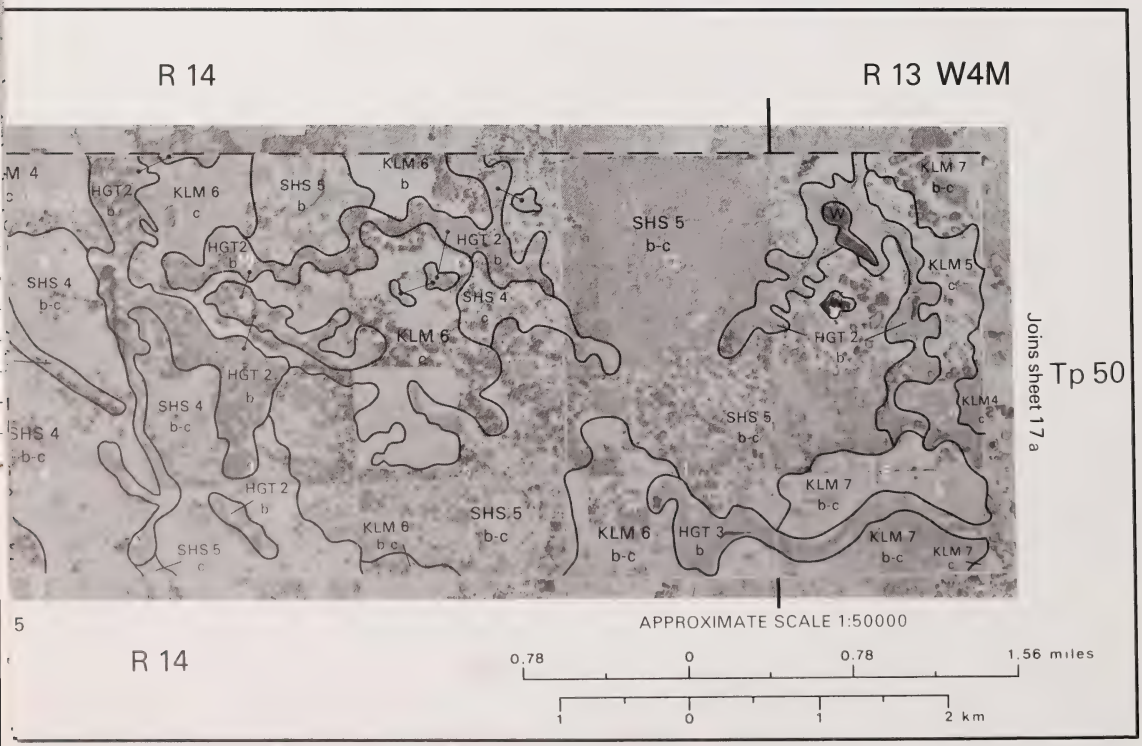
APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km



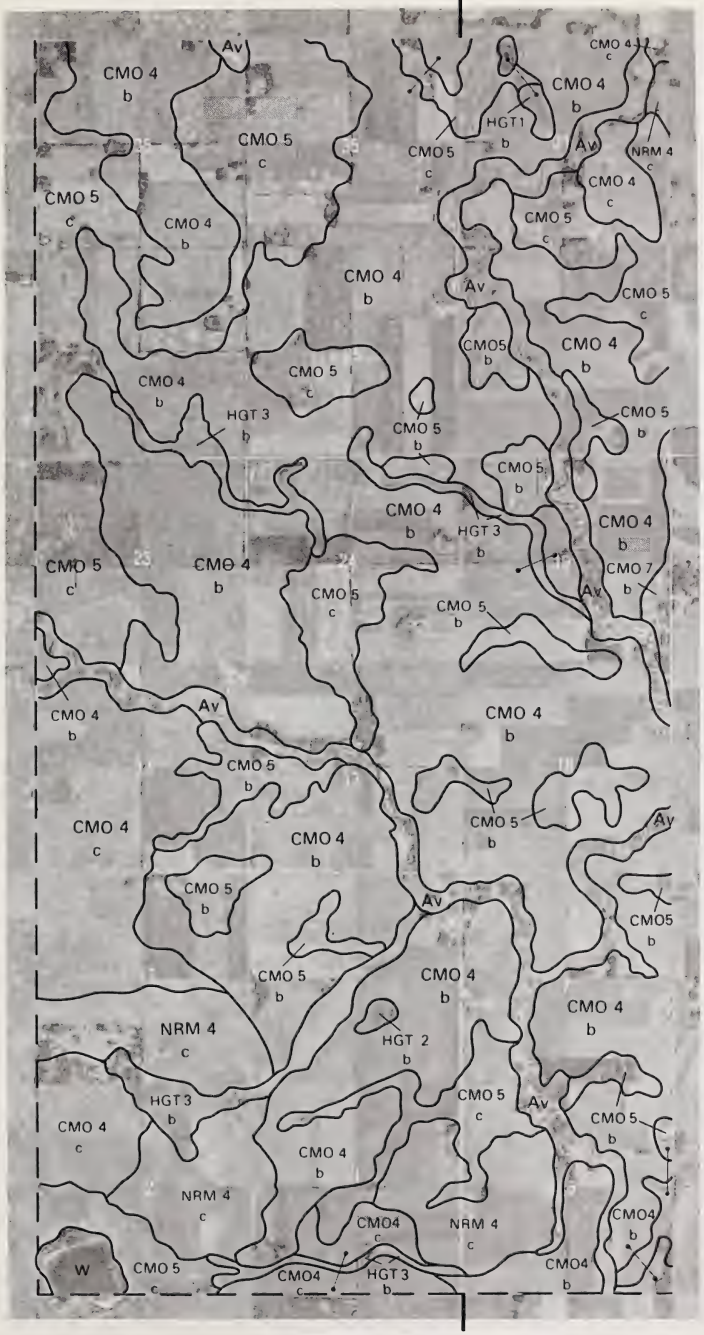
Soil Survey - County of Beaver - Mosaic No.11


R 14
R 13 W4M
KLM 6
b
HGT 2
b
KLM 6
c
SHS 5
b
HGT 2
b
HGT 2
b
SHS 4
b-c
SHS 4
c
KLM 6
c
HGT 2
b
SHS 4
b-c
SHS 4
b-c
HGT 2
b
SHS 5
c
KLM 6
b c
SHS 5
b-c
SHS 5
b-c
KLM 6
b-c
HGT 3
b
KLM 7
b-c
KLM 7
b-c
KLM 7
c
KLM 5
c
HGT 2
b
KLM 4
c
SHS 5
b-c
KLM 7
b-c
Joins sheet 17 a
Tp 50
APPROXIMATE SCALE 1:50000
R 14
0.78
0
0.78
1.56 miles
1
0
1
2 km

R 19

R 18 W4M

Joins sheet 8



Tp 49

Tp 49

Joins sheet 13

APPROXIMATE SCALE 1:50000

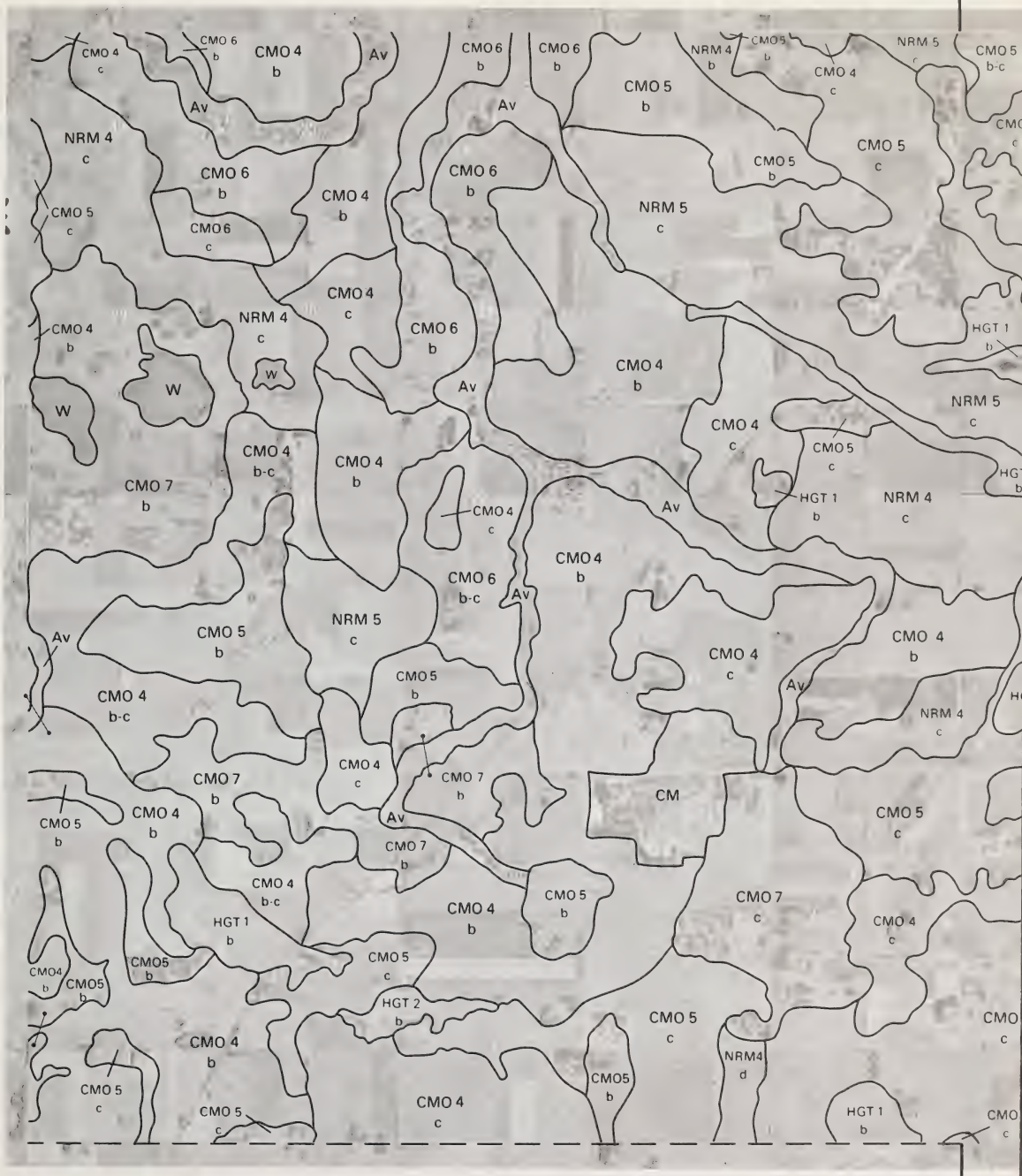
0.78 0 0.78 1.56 miles

1 0 1 2 km

Soil Survey - County of Beaver - Mosaic - No.12

R 18

Joins sheet 9



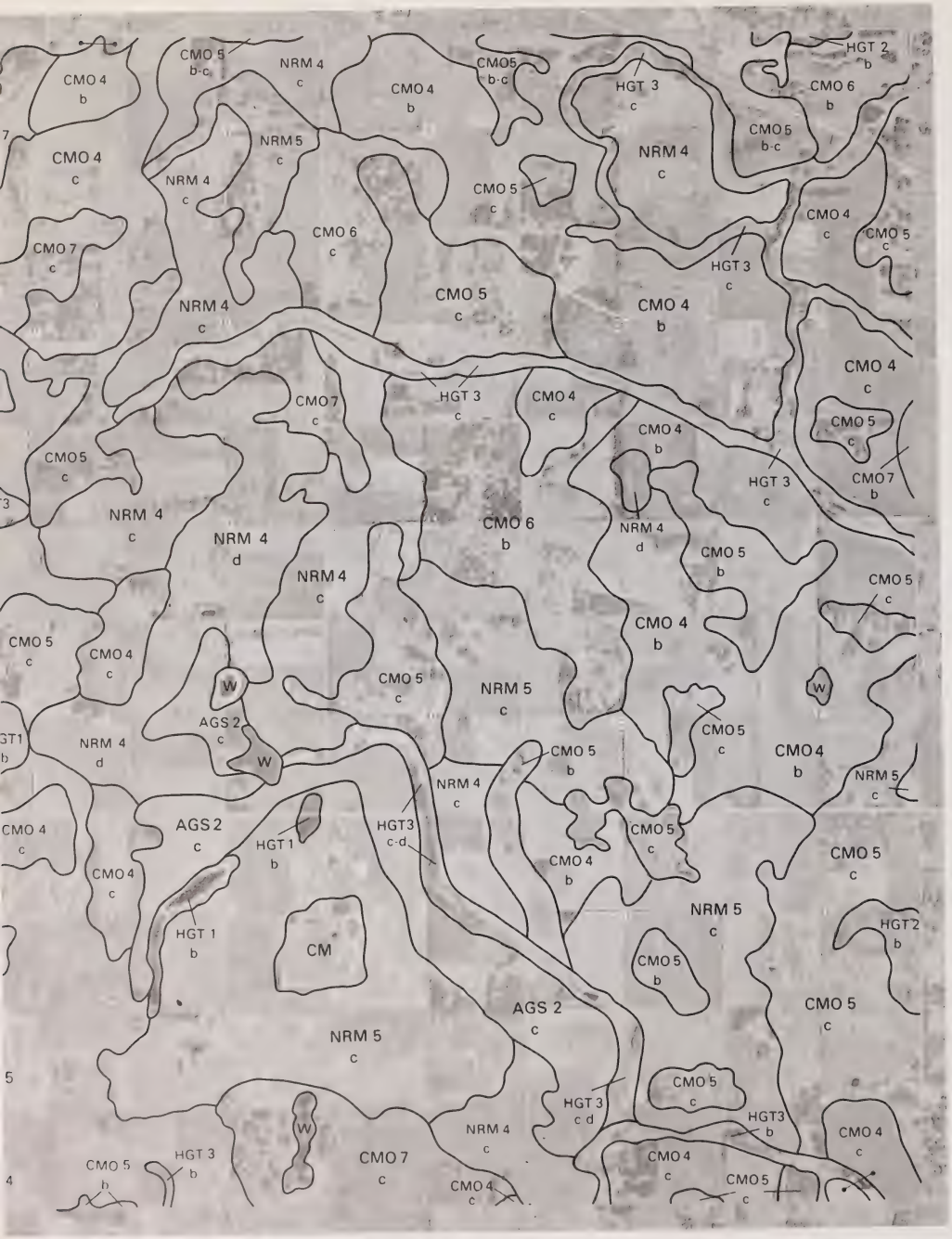
Tp 49

Joins sheet 12

R 18

Soil Survey - County of Beaver - Mosaic No.13

R 17 W4M



Joins sheet 14

Tp 49

Joins sheet 18

R 17

APPROXIMATE SCALE 1:50000

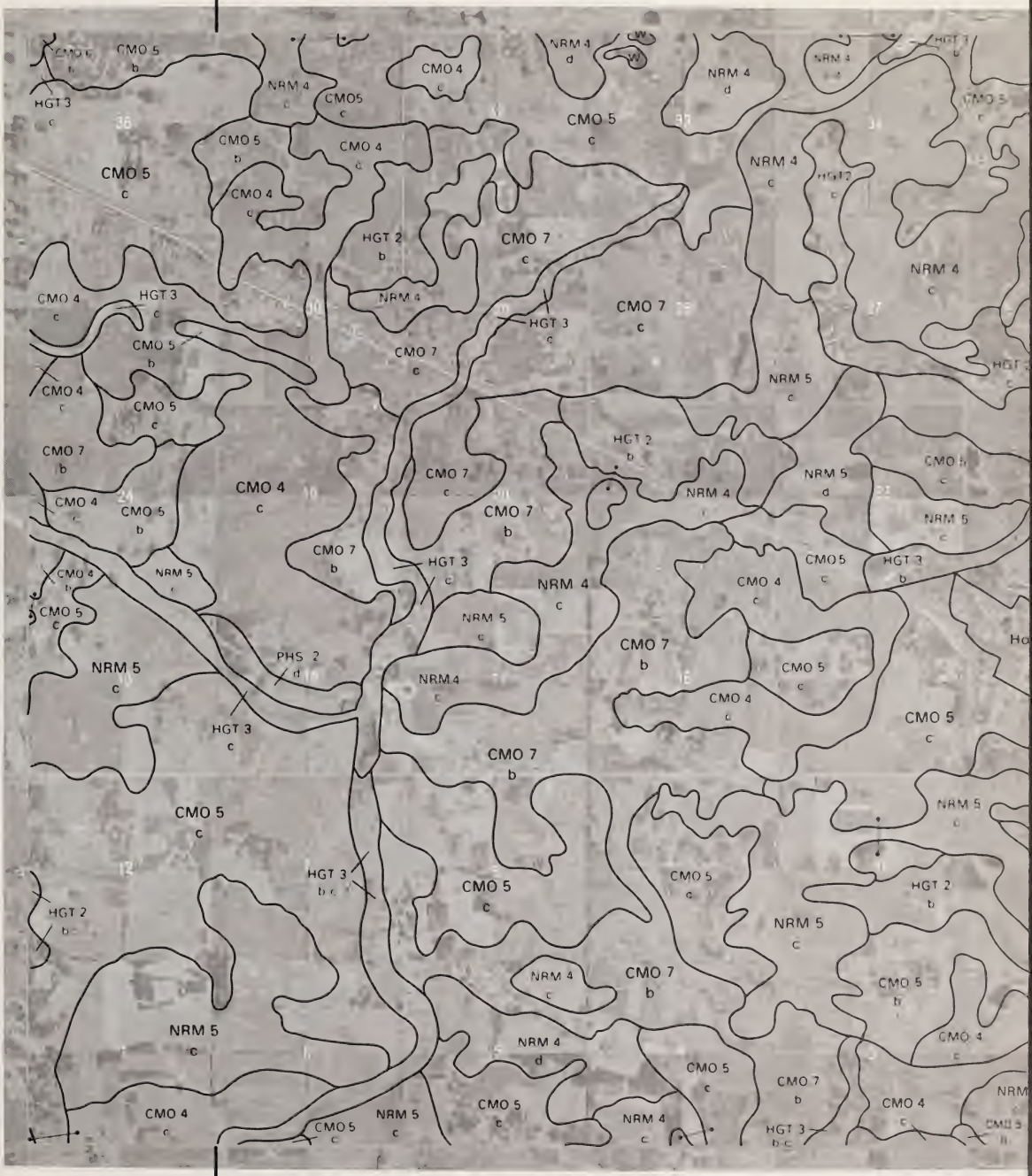
0.78 0 0.78 1.56 miles

1 0 1 2 km

R 17

R 16

Joins sheet 10



Tp 49

Joins sheet 13

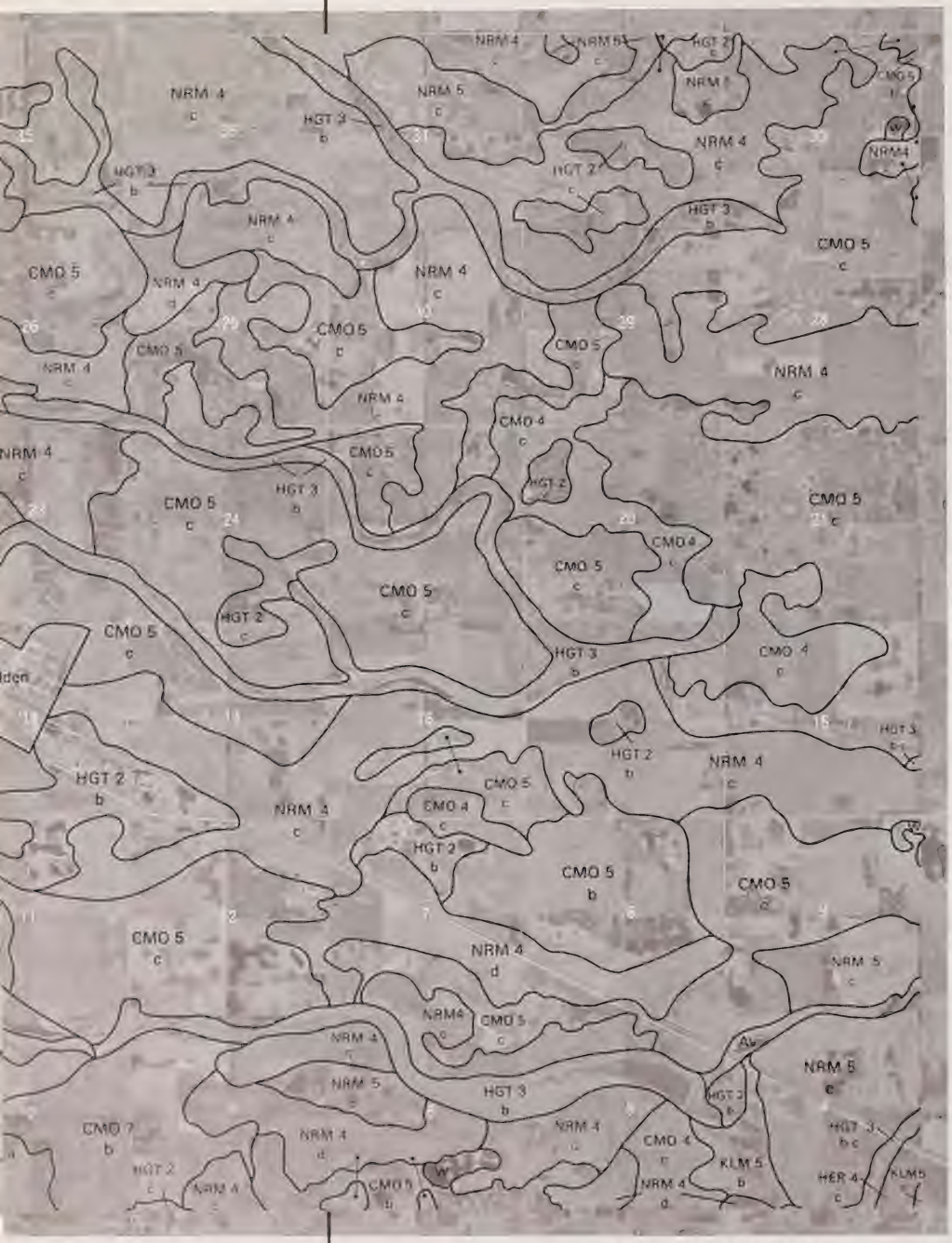
Joins sheet 19

R 17

R 16

Soil Survey - County of Beaver - Mosaic - No.14

R 15 W4M



Joins sheet 15

Tp 49

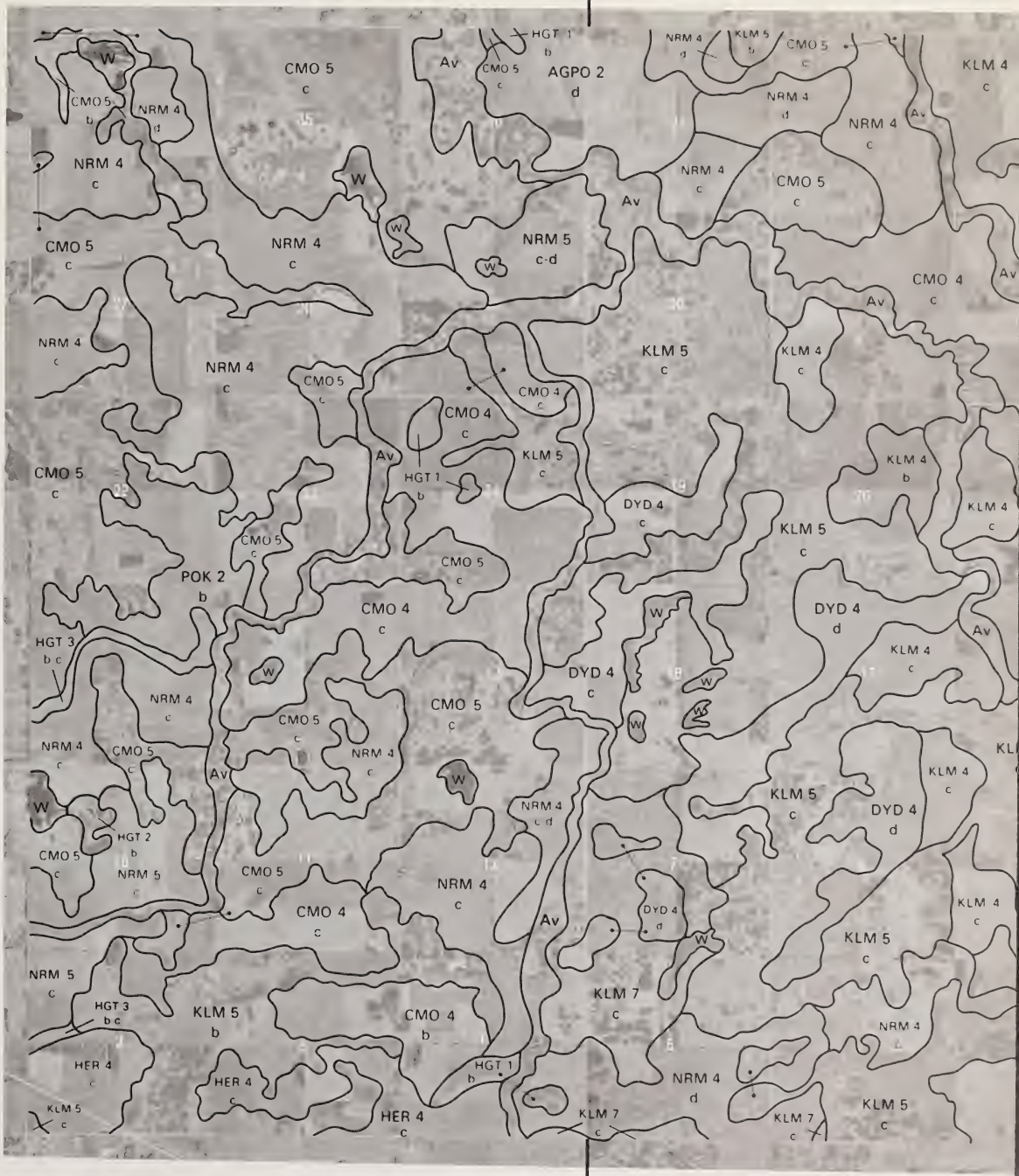
APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 15

Joins sheet 11



Tp 49

Joins sheet 14

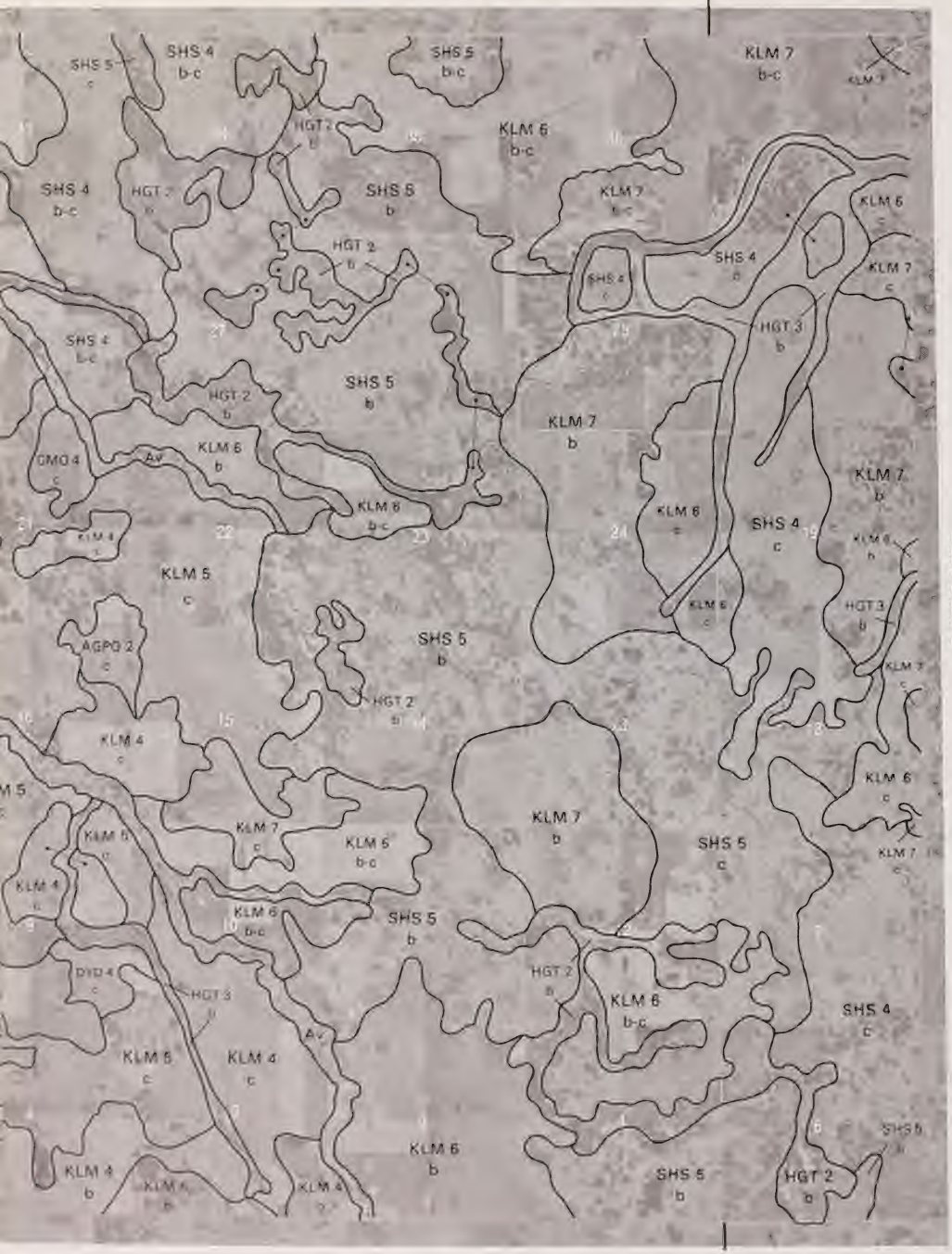
Joins sheet 20

R 15

Soil Survey - County of Beaver - Mosaic No.15

R 14

R 13 W4M



Joins sheet 16

Tp 49

APPROXIMATE SCALE 1:50000

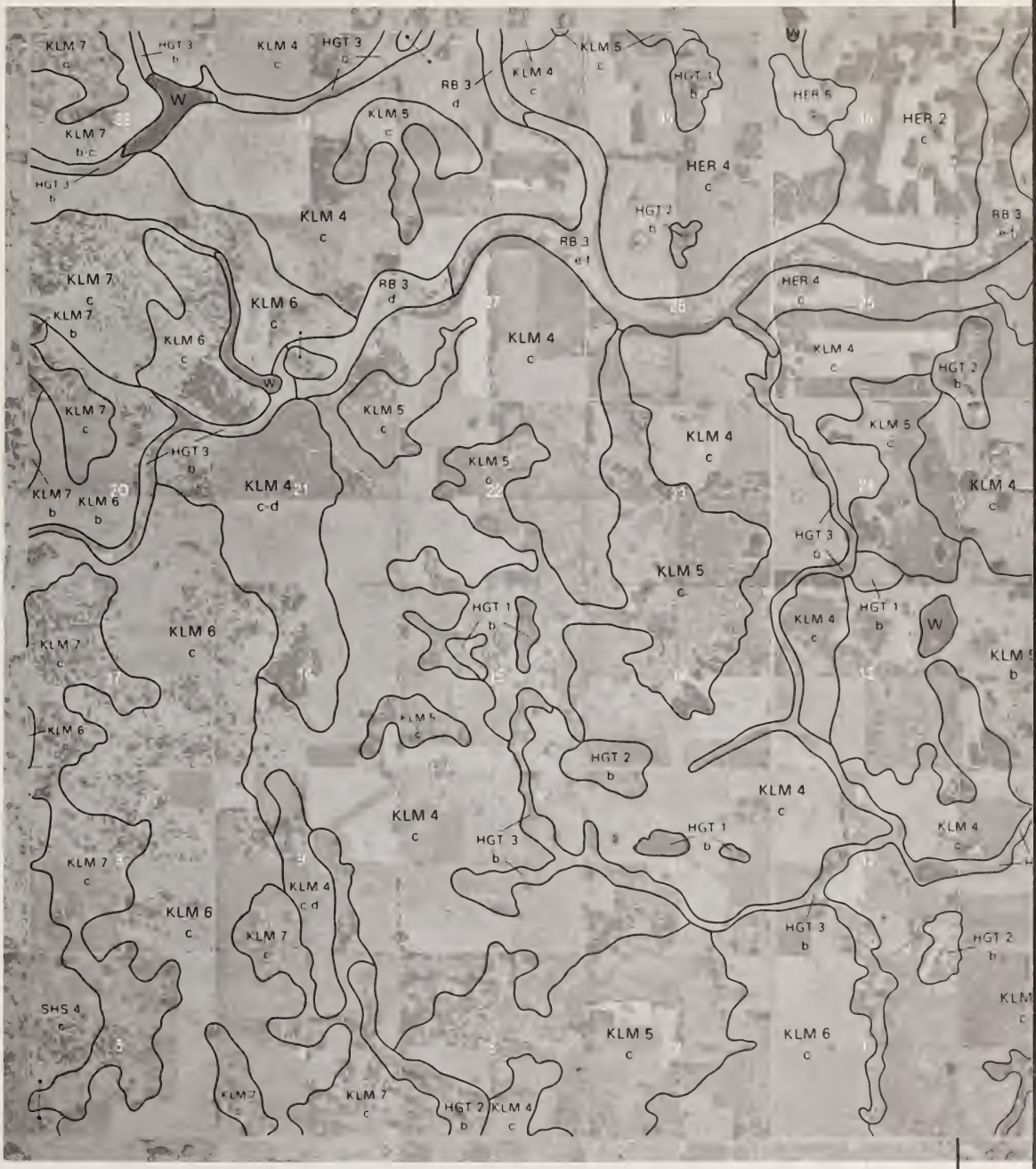
R 14

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 13

Joins sheet 17 a



Tp 49

Joins sheet 15

R 13

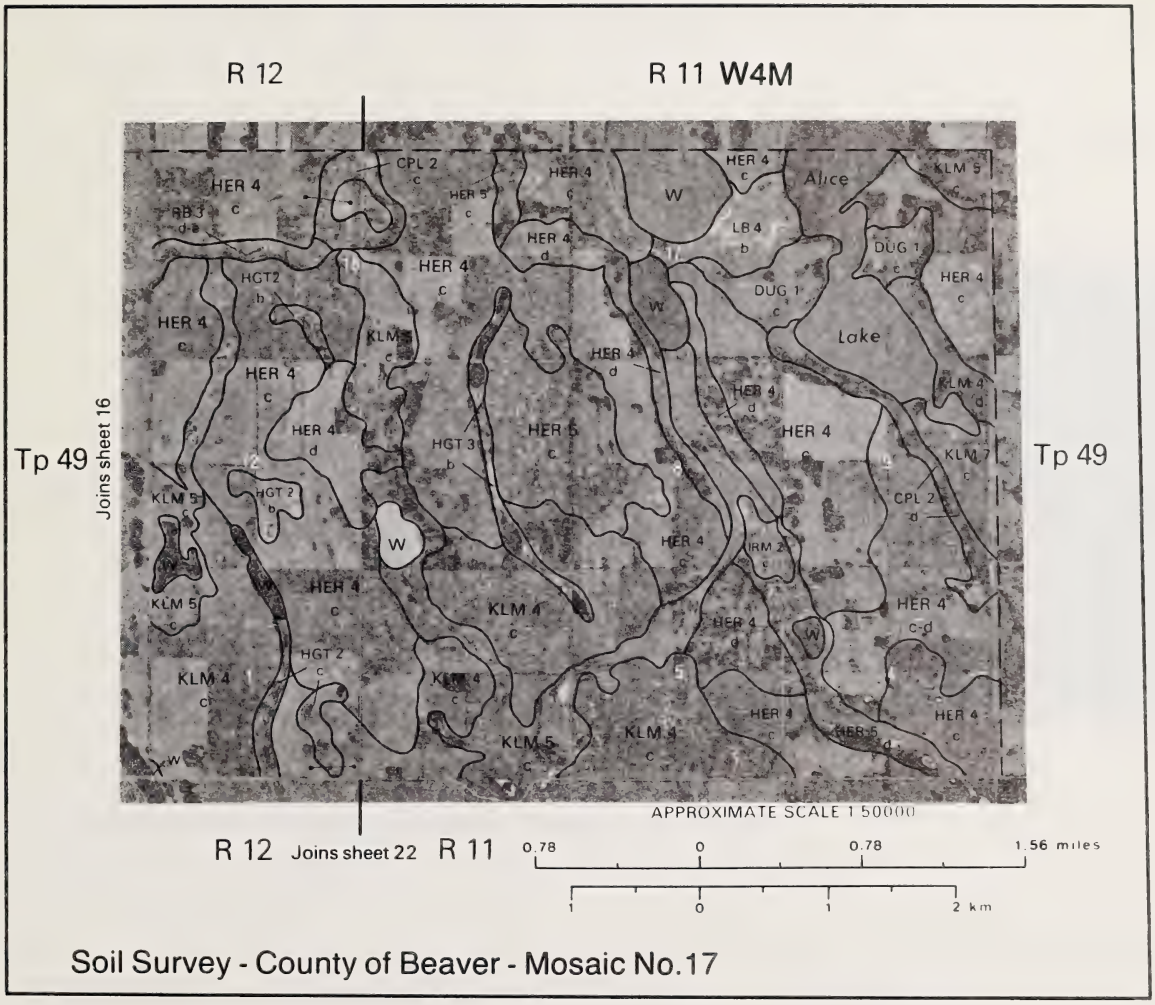
Joins sheet 21

Soil Survey - County of Beaver - Mosaic - No.16

R 12 **W4M**

HER 4 c
HER 4 d
HER 4 c-d
KLM 4 c
KLM 5 c
HER 5 c
HER 5 c-d
HGT 2 c
HGT 3 b
HGT 3 c
RB 3 d-e
W
Tp 49
Joins sheet 17
APPROXIMATE SCALE 1:50000
0.78 0 0.78 1.56 miles
1 0 1 2 km

R 12



Soil Survey - County of Beaver - Mosaic No.17

R 13

Tp 50

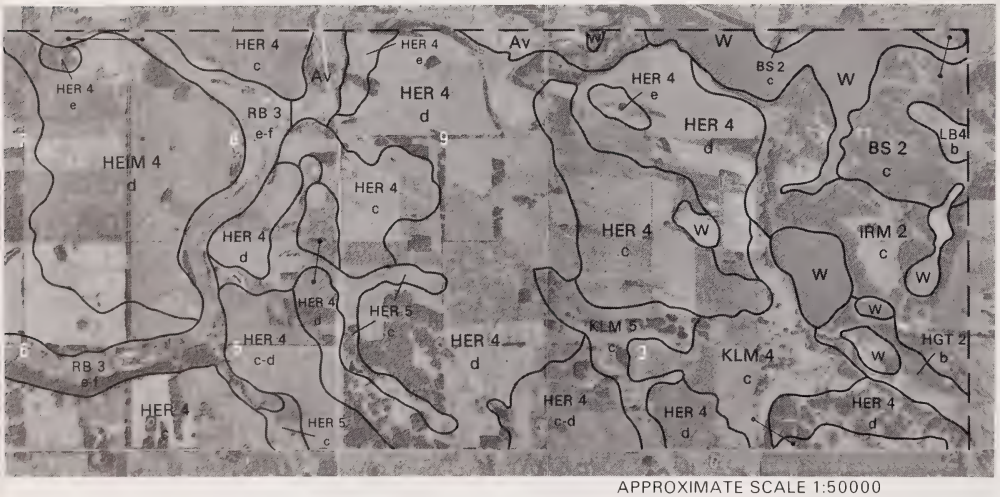
Joins sheet 11

R 13

Joins sheet 16

Soil Survey - County of Beaver - Mosaic - No.17a

R 12 W4M



Tp 50

APPROXIMATE SCALE 1:50000

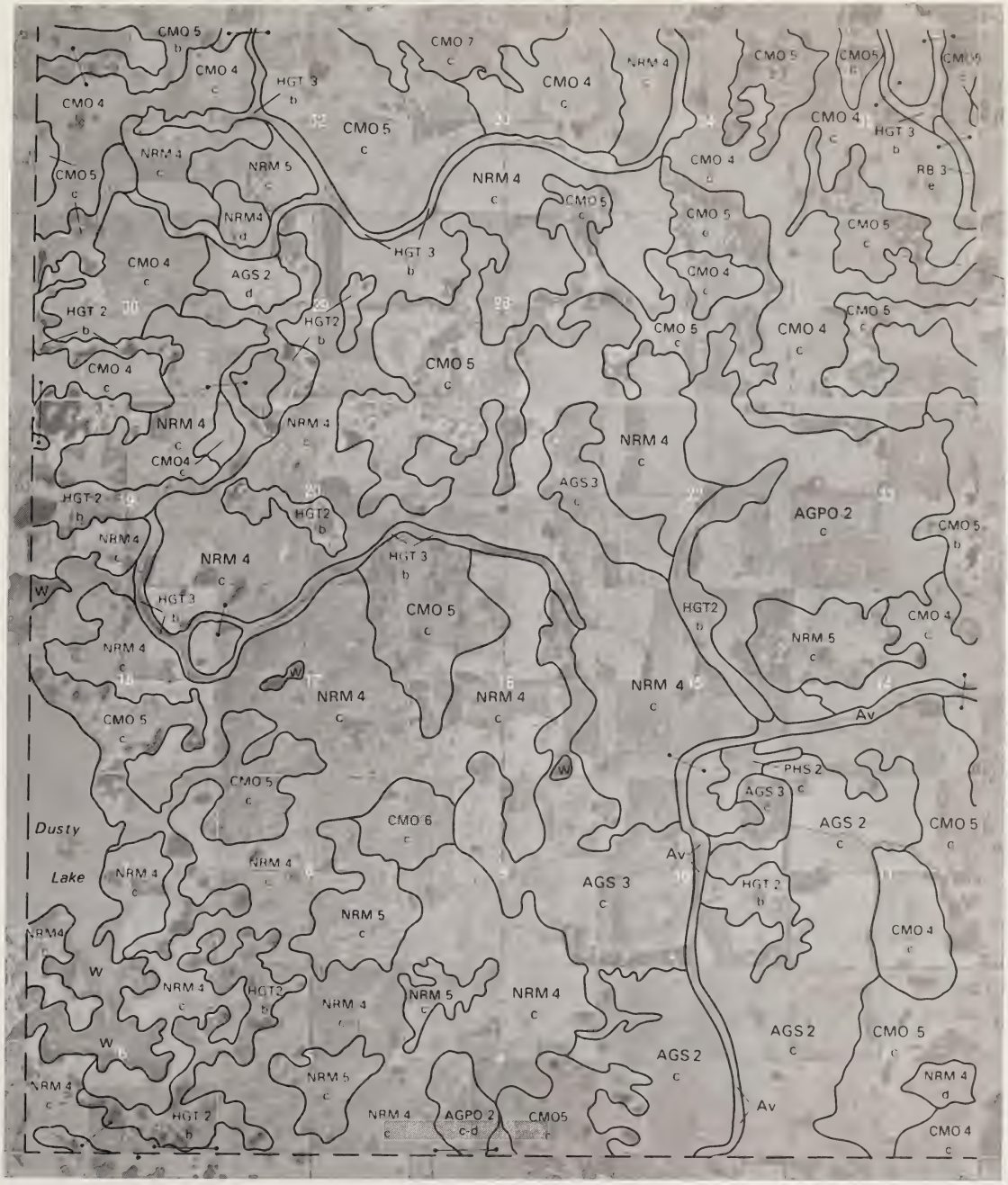
R 12

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 17 W4M

Joins sheet 13



Tp 48

Joins sheet 19

R 17

Soil Survey - County of Beaver -
Mosaic - No.18

APPROXIMATE SCALE 1:50000

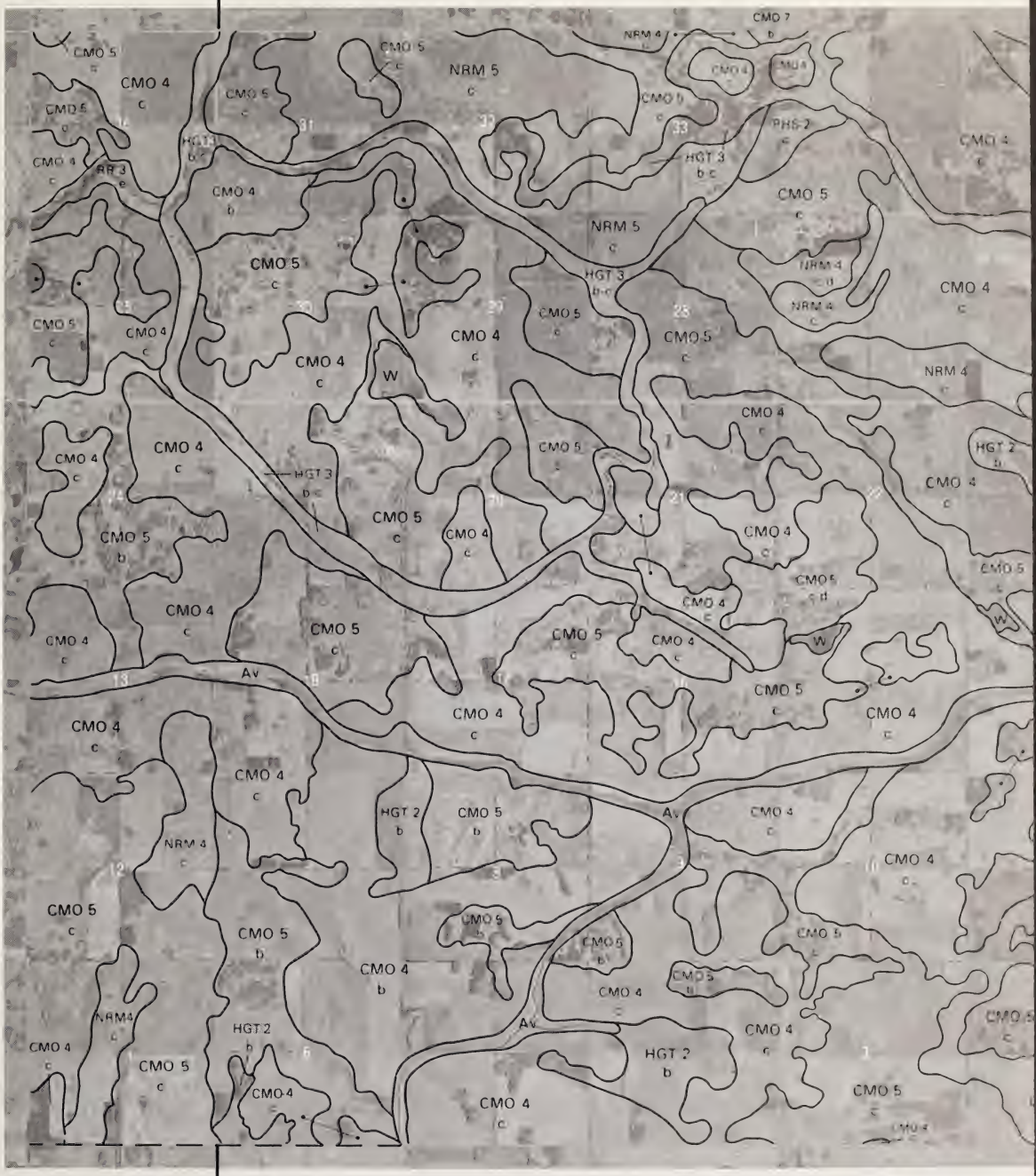
0.78 0 0.78 1.56 m

1 0 1 2 km

R 17

R 16

Joins sheet 14



Joins sheet 18

Tp 48

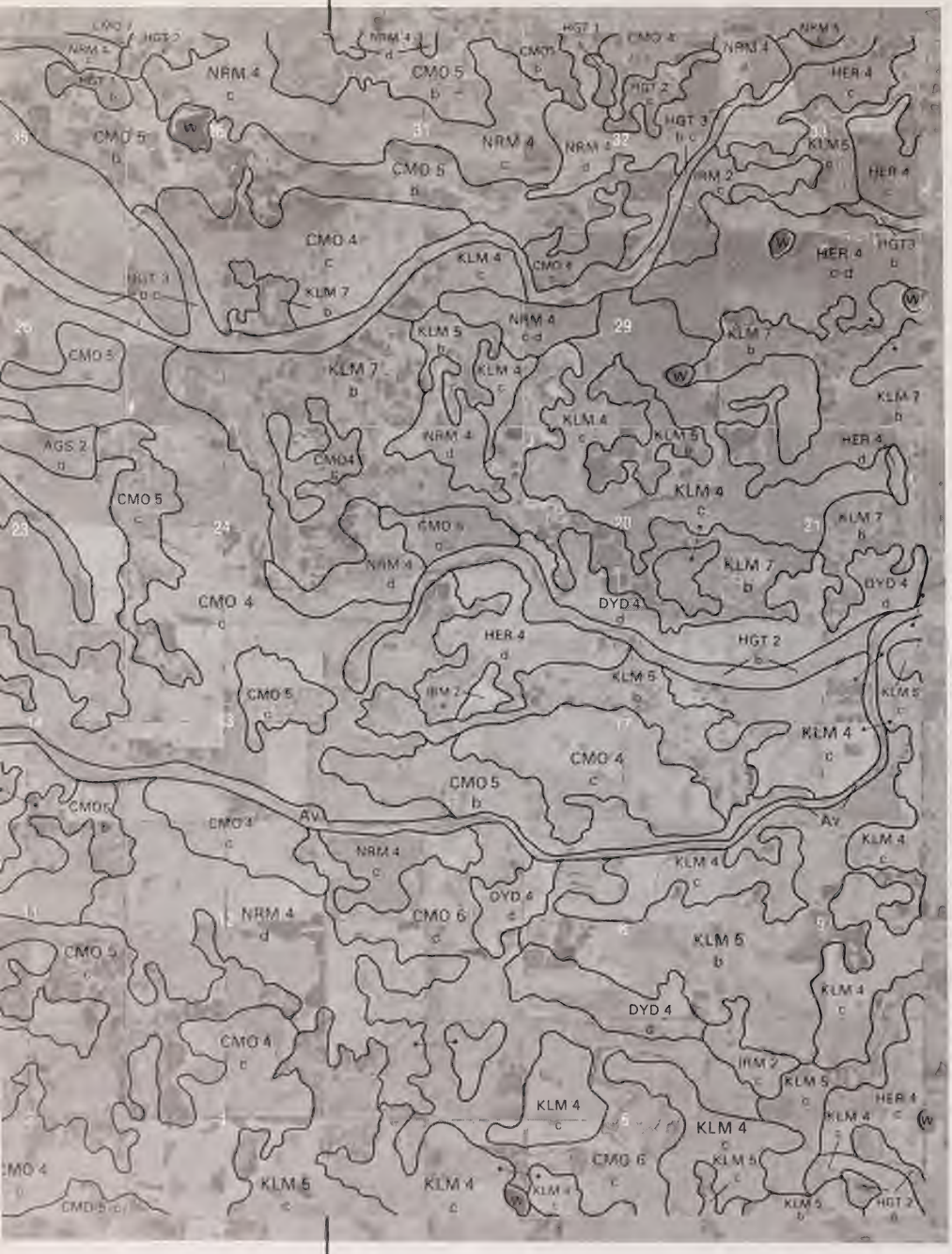
Joins sheet 23

R 17

R 16

Soil Survey - County of Beaver - Mosaic No.19

R 15 **W4M**



Joins sheet 20 Tp 48

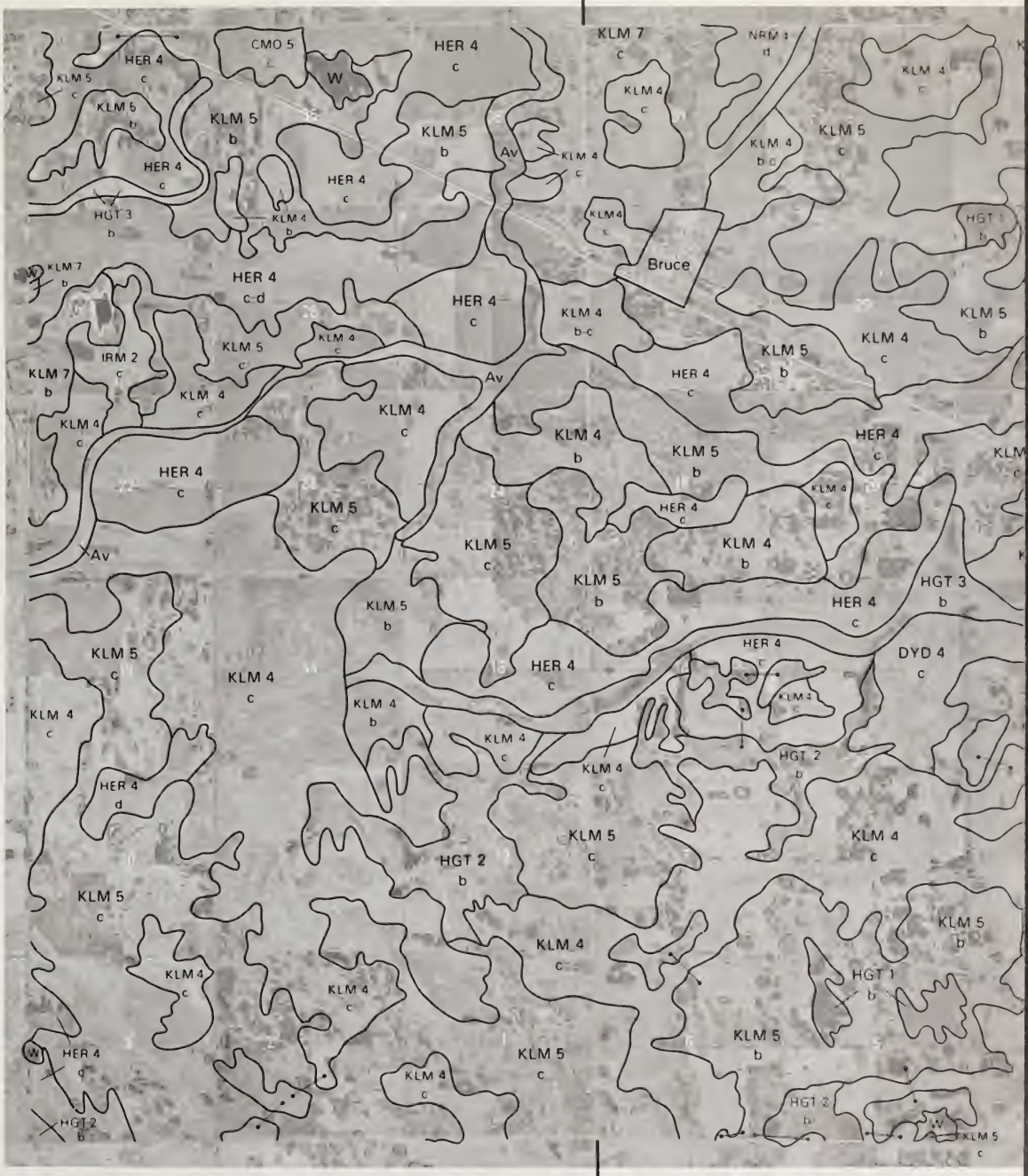
APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 15

Joins sheet 1



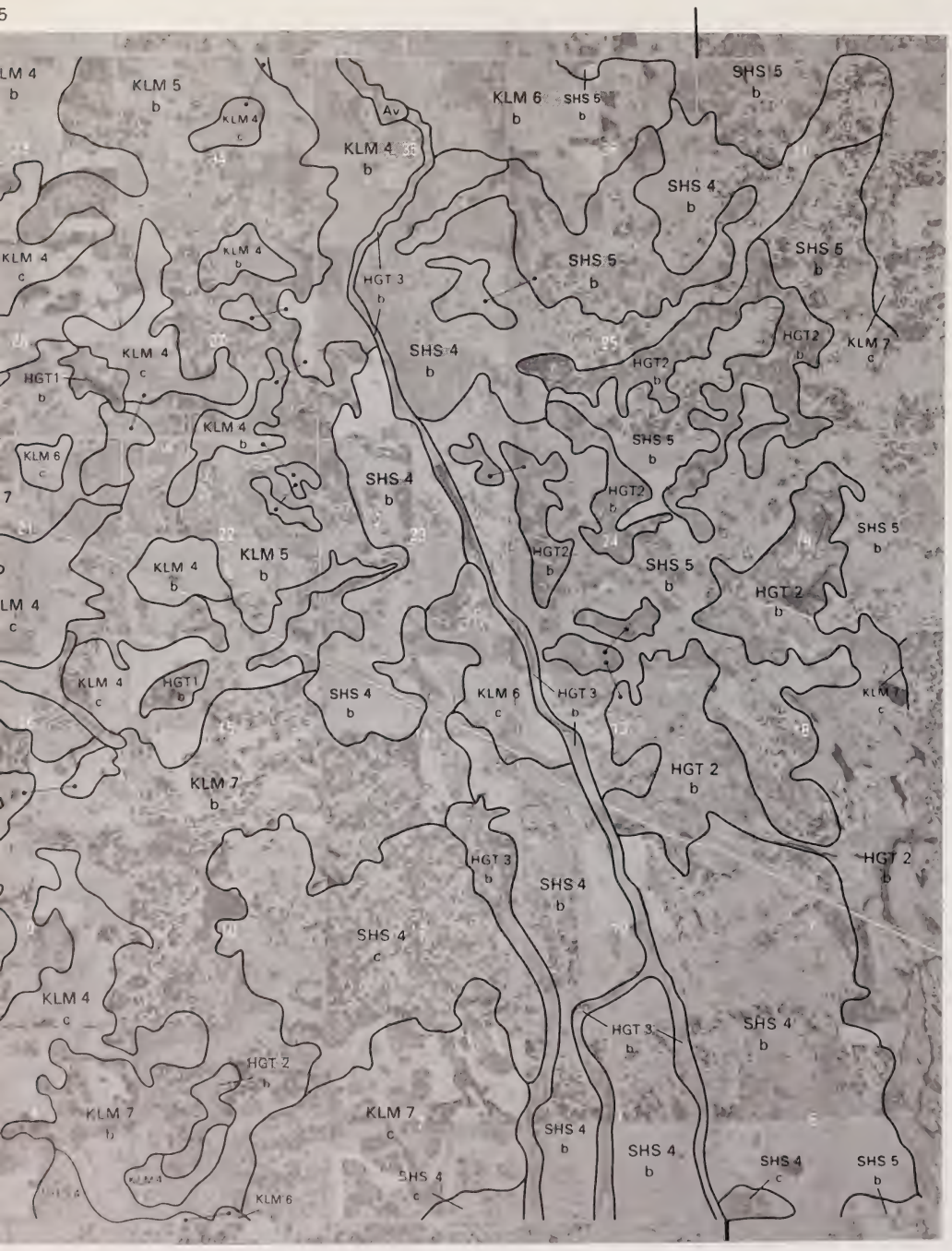
Joins sheet 19

Tp 48

Joins sheet 2

R 15

Soil Survey - County of Beaver - Mosaic - No.20



Joins sheet 21

Tp 48

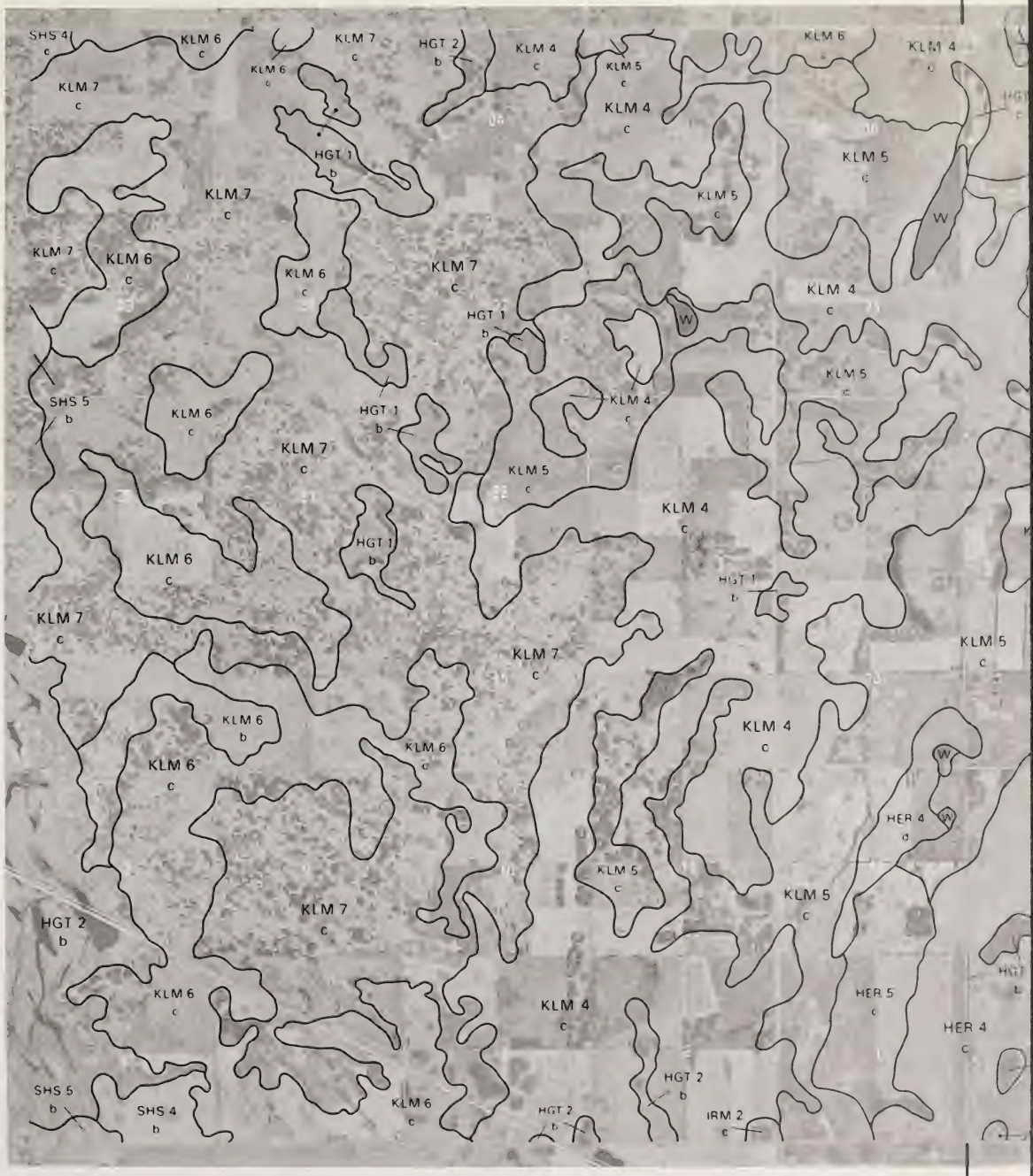
APPROXIMATE SCALE 1:50000

0 0.78 0 0.78 1.56 miles

1 0 1 2 km

R 13

Joins sheet 16



Tp 48

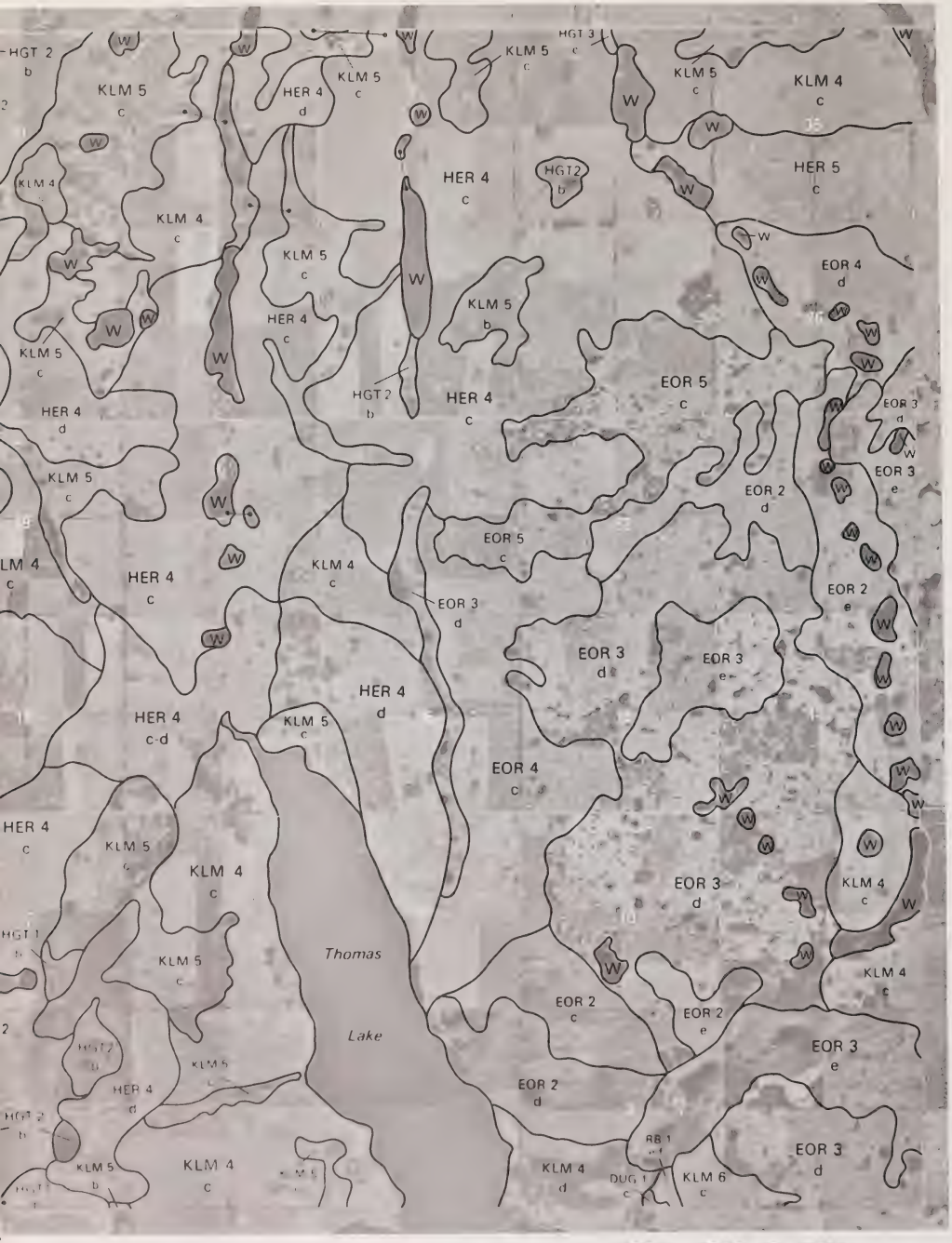
Joins sheet 20

R 13

Joins sheet 25

Soil Survey - County of Beaver - Mosaic No.21

R 12 W4M



Joins sheet 22

Tp 48

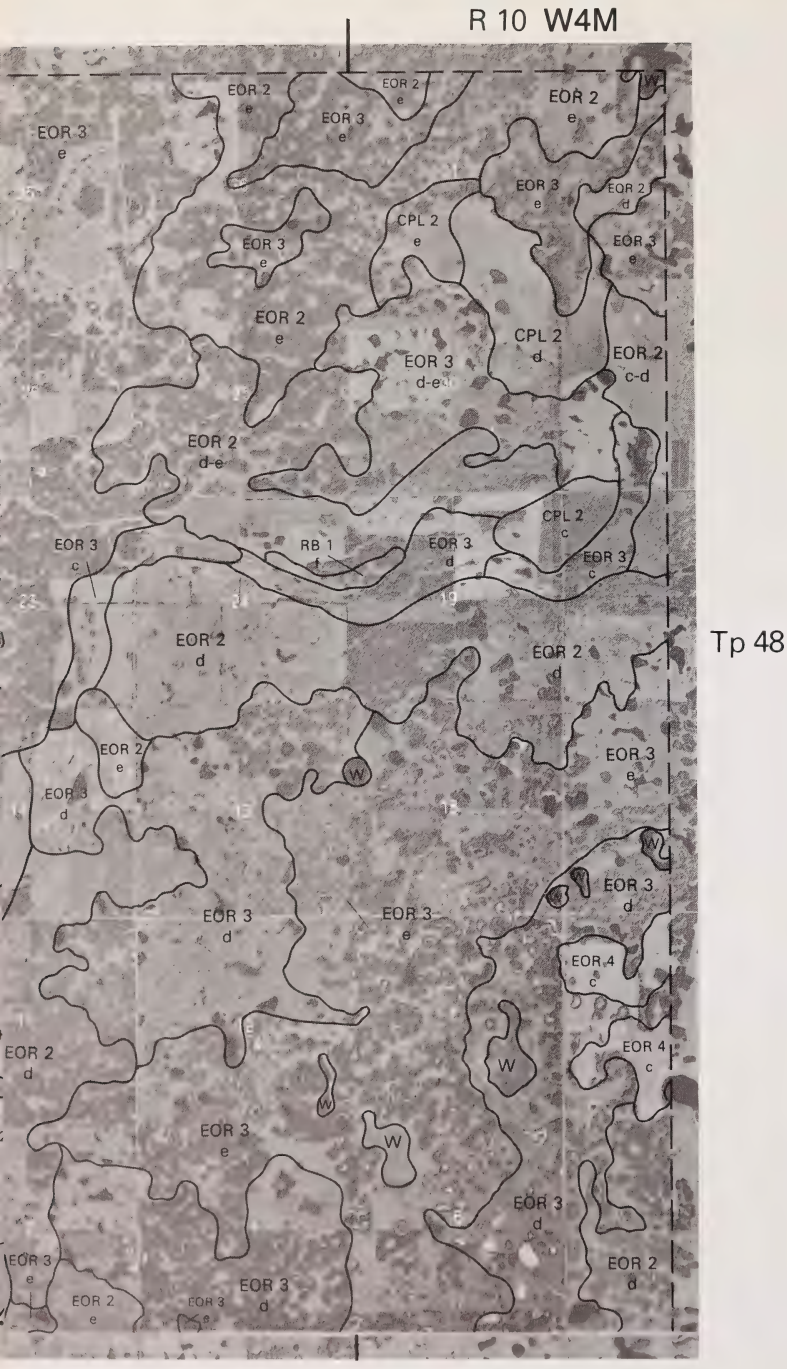
APPROXIMATE SCALE 1:50000

R 12

0.78 0 0.78 1.56 miles

1 0 1 2 km

Soil Survey - County of Beaver - Mosaic - No.22



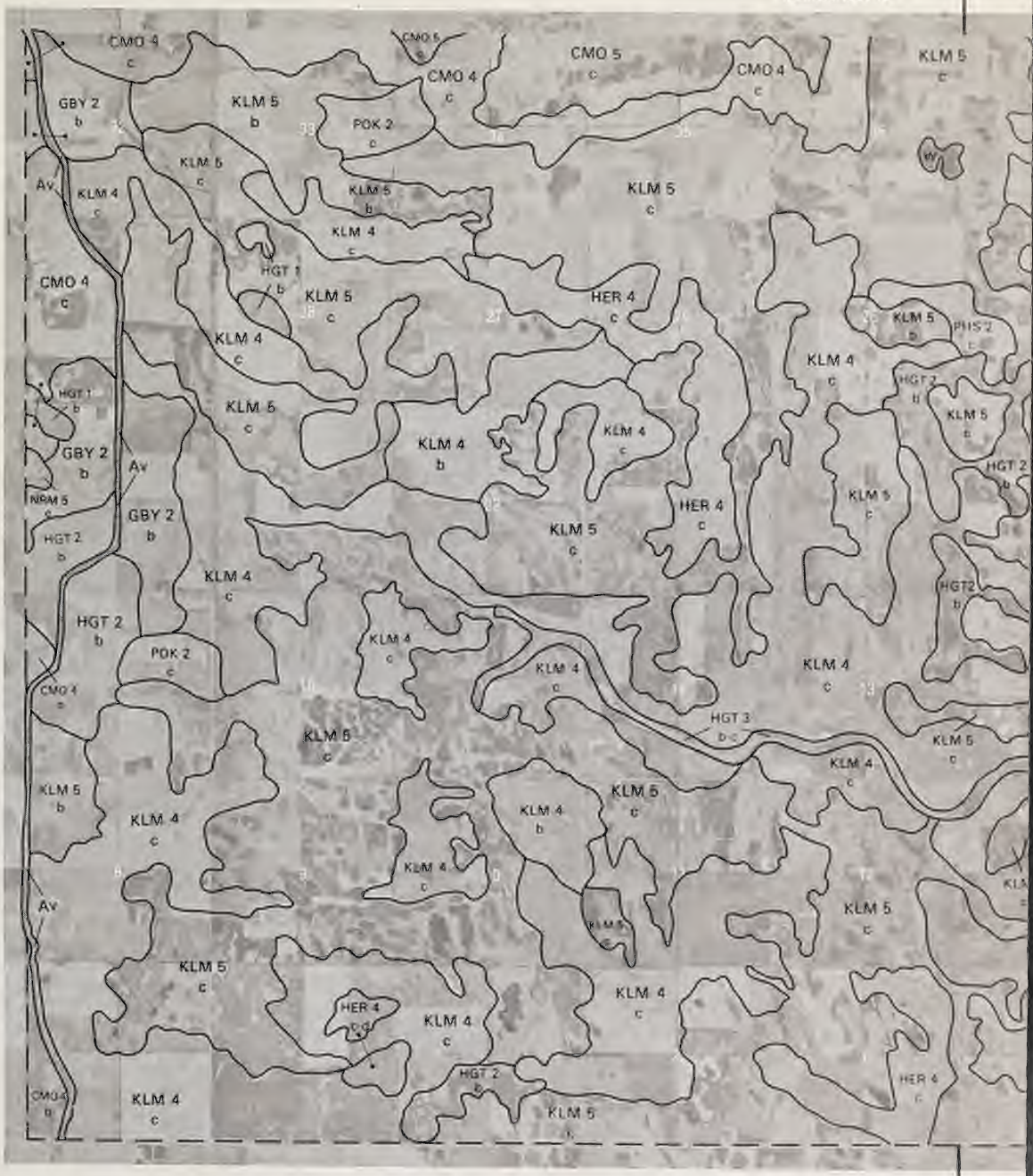
APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 16

Joins sheet 19

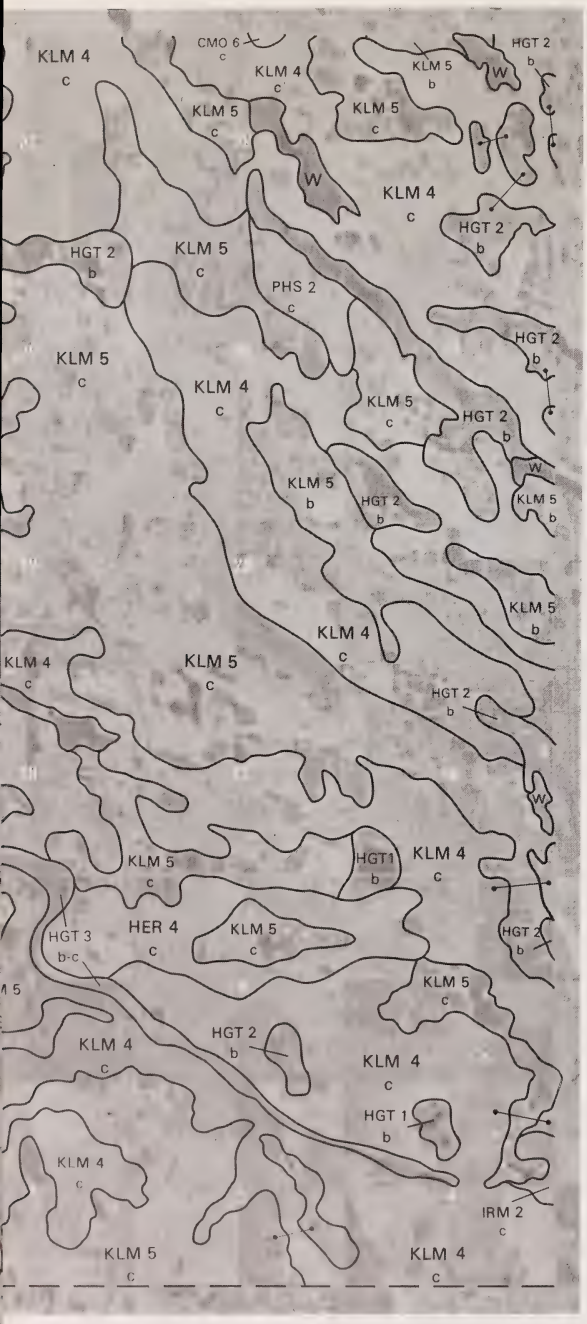


Tp 47

R 16

Soil Survey - County of Beaver - Mosaic No.23

R 15 **W4M**



Joins sheet 24

Tp 47

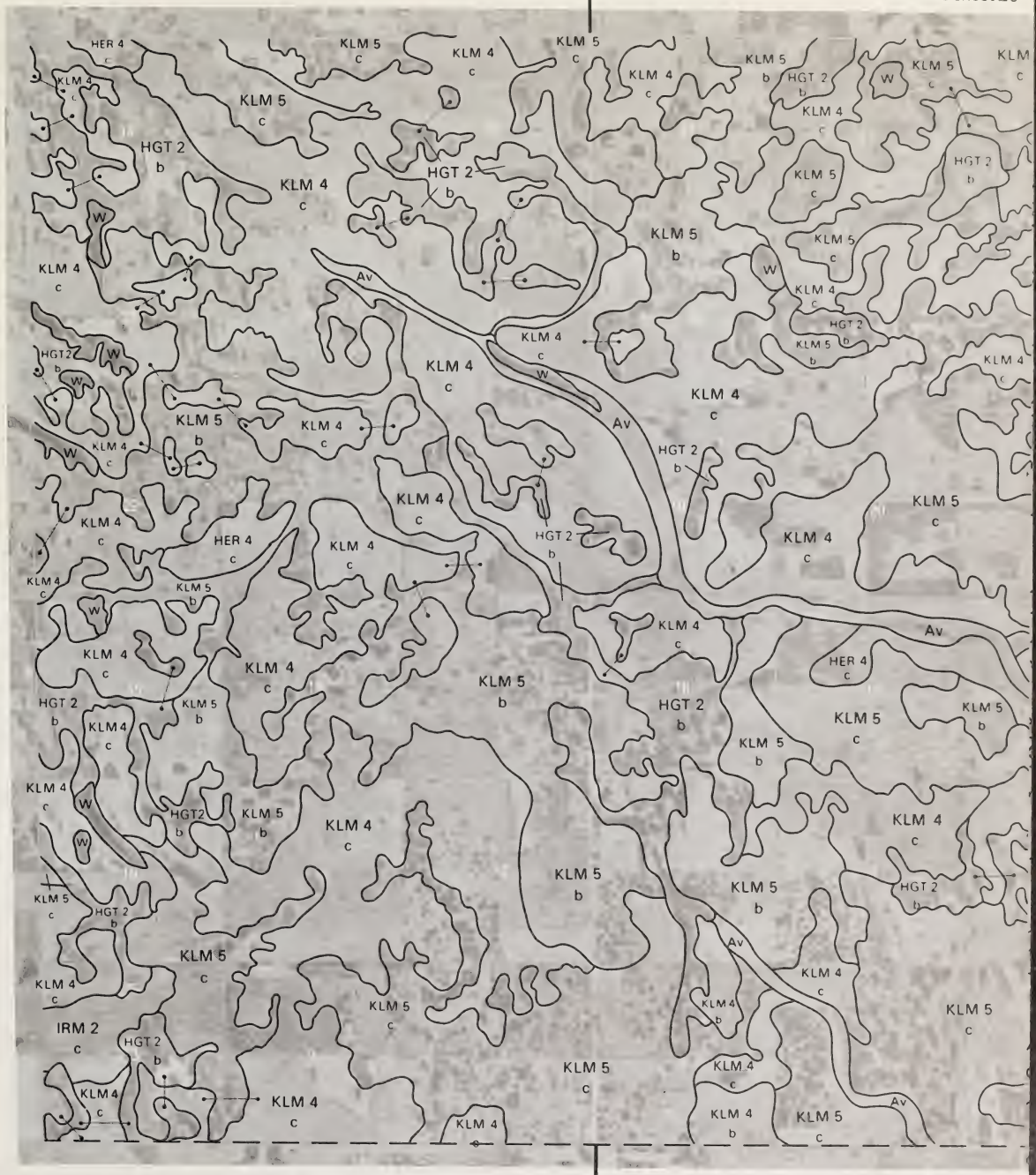
APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 15

Joins sheet 20



Tp 47

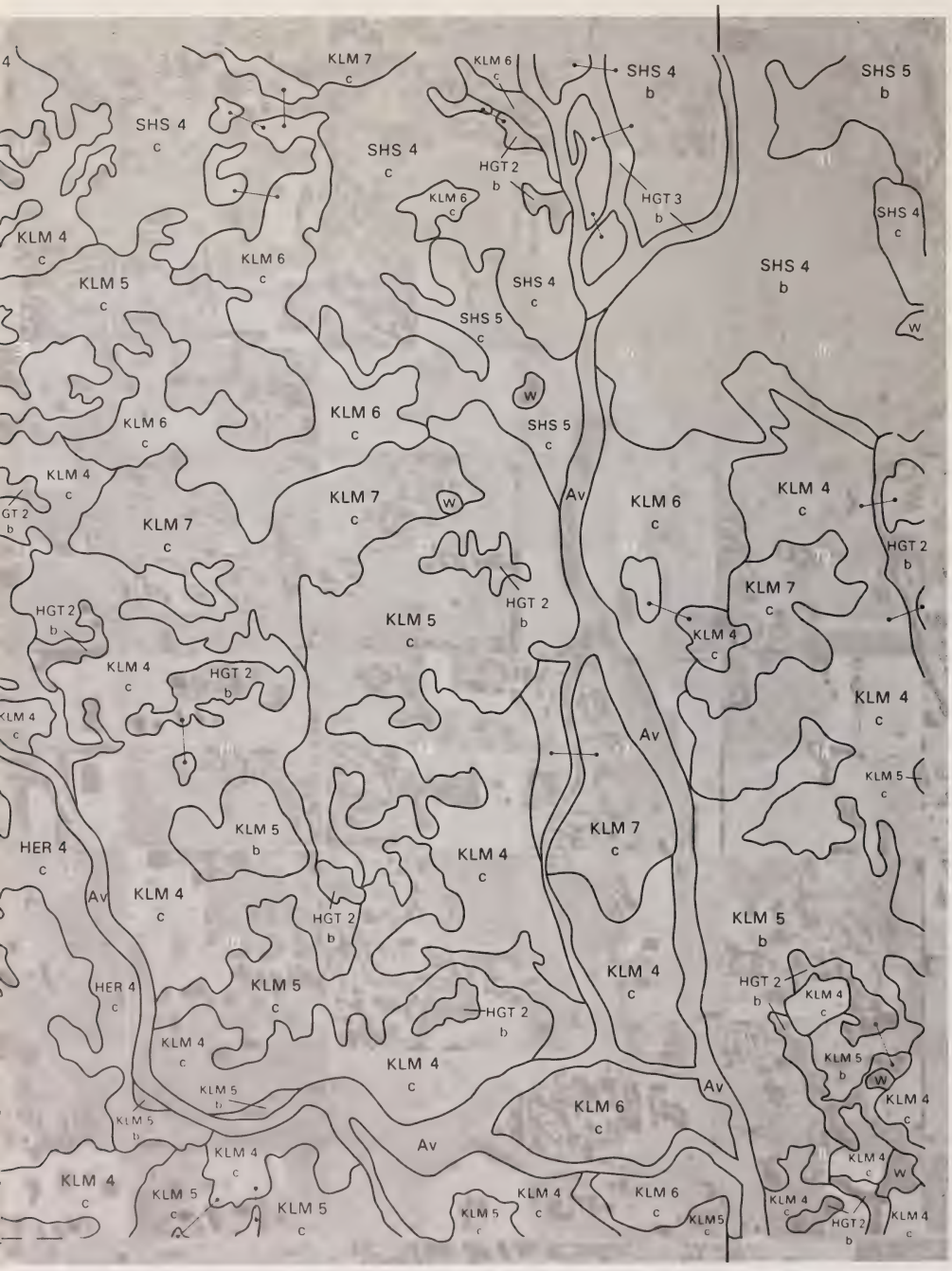
Joins sheet 23

R 15

Soil Survey - County of Beaver - Mosaic - No.24

R 14

R 13 W4M



Joins sheet 25

Tp 47

Joins sheet 27

APPROXIMATE SCALE 1:50000

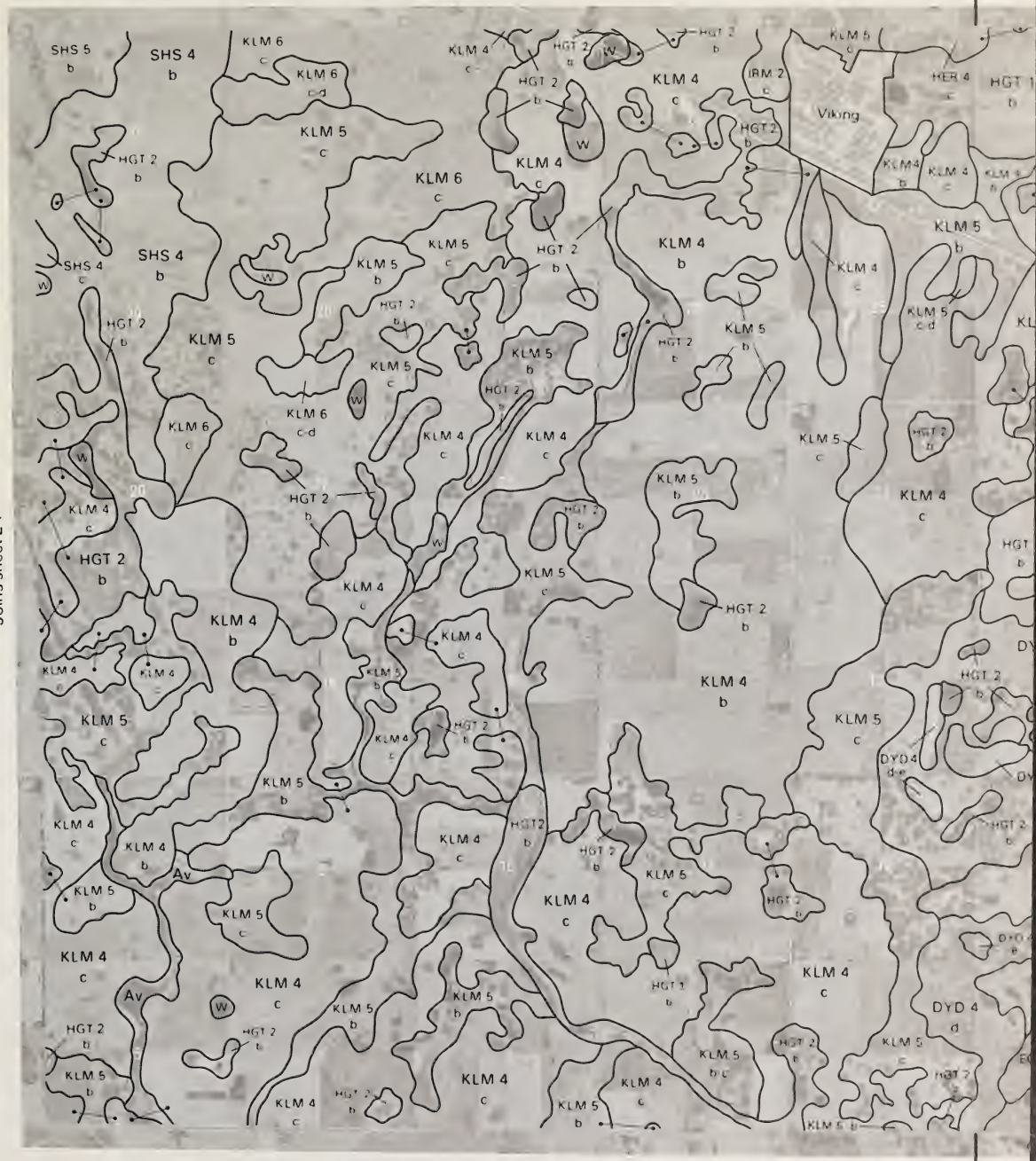
R 14

0.78 0 0.78 1.56 miles

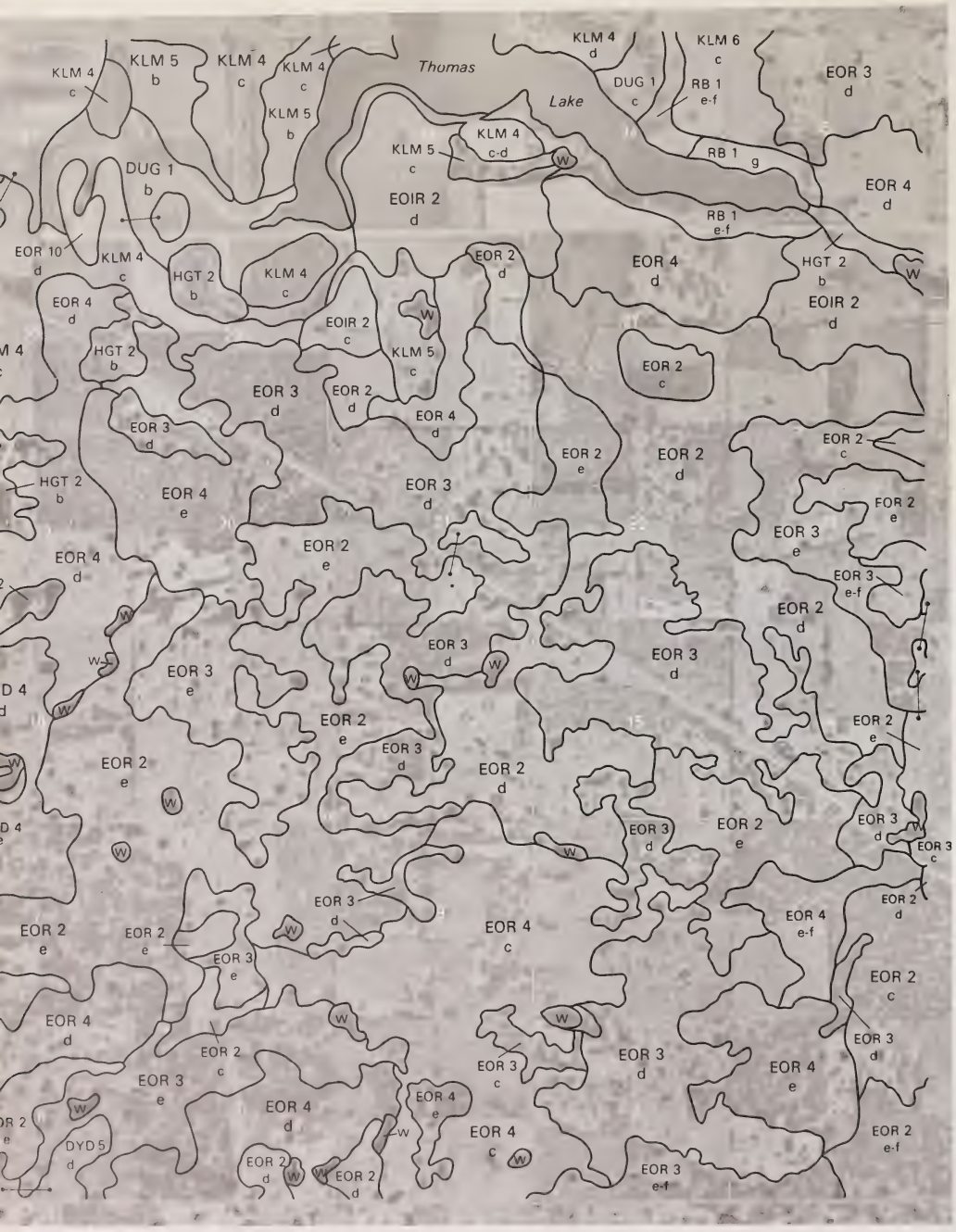
1 0 1 2 km

R 13

Joins sheet 21


SHS 5 b
SHS 4 b
KLM 6 c
KLM 6 c-d
KLM 5 c
KLM 4 c
HGT 2 b
W
KLM 4 b
IRM 2 c
Viking
HER 4 c
HGT 1 b
KLM 5 b
KLM 4 c
KLM 5 c-d
KLM 6 c-d
KLM 5 b
HGT 2 b
KLM 5 c
KLM 4 c
KLM 4 b
KLM 5 b
KLM 5 c
KLM 4 c
KLM 4 b
KLM 5 c
KLM 4 c
KLM 4 b
KLM 5 c
KLM 4 c
KLM 4

R 12 W4M



Joins sheet 26 Tp 47

R 12

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 12

R 11

Joins sheet 22

Tp 47

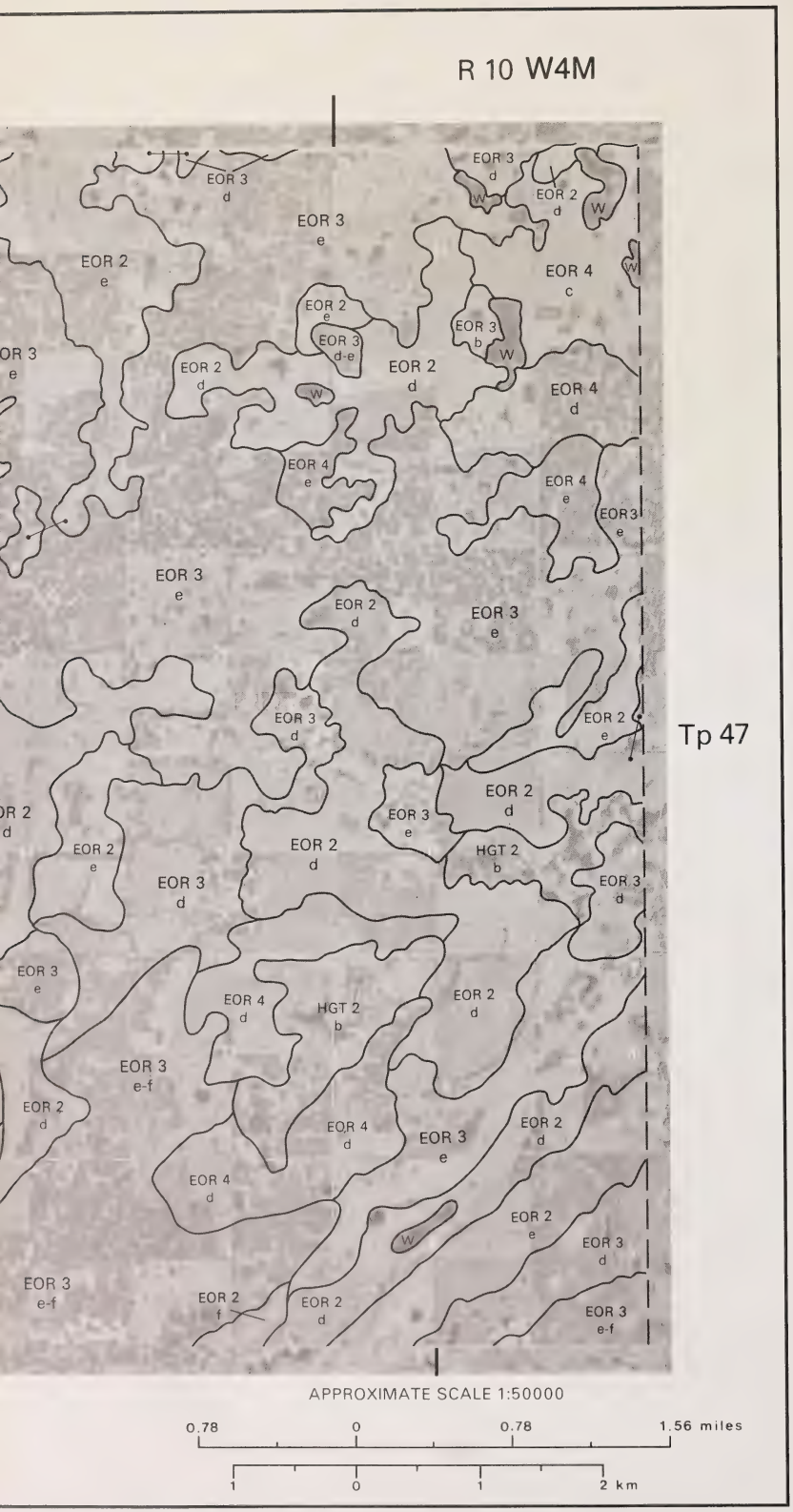
Joins sheet 25

Joins sheet 29

R 12

R 11

Soil Survey - County of Beaver - Mosaic - No.26



APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

R 14 **W4M**

Joins sheet 24

Tp 46

Tp 46

Joins sheet 28

APPROXIMATE SCALE 1:50000

R 14

0.78 0 0.78 1.56 miles

1 0 1 2 km

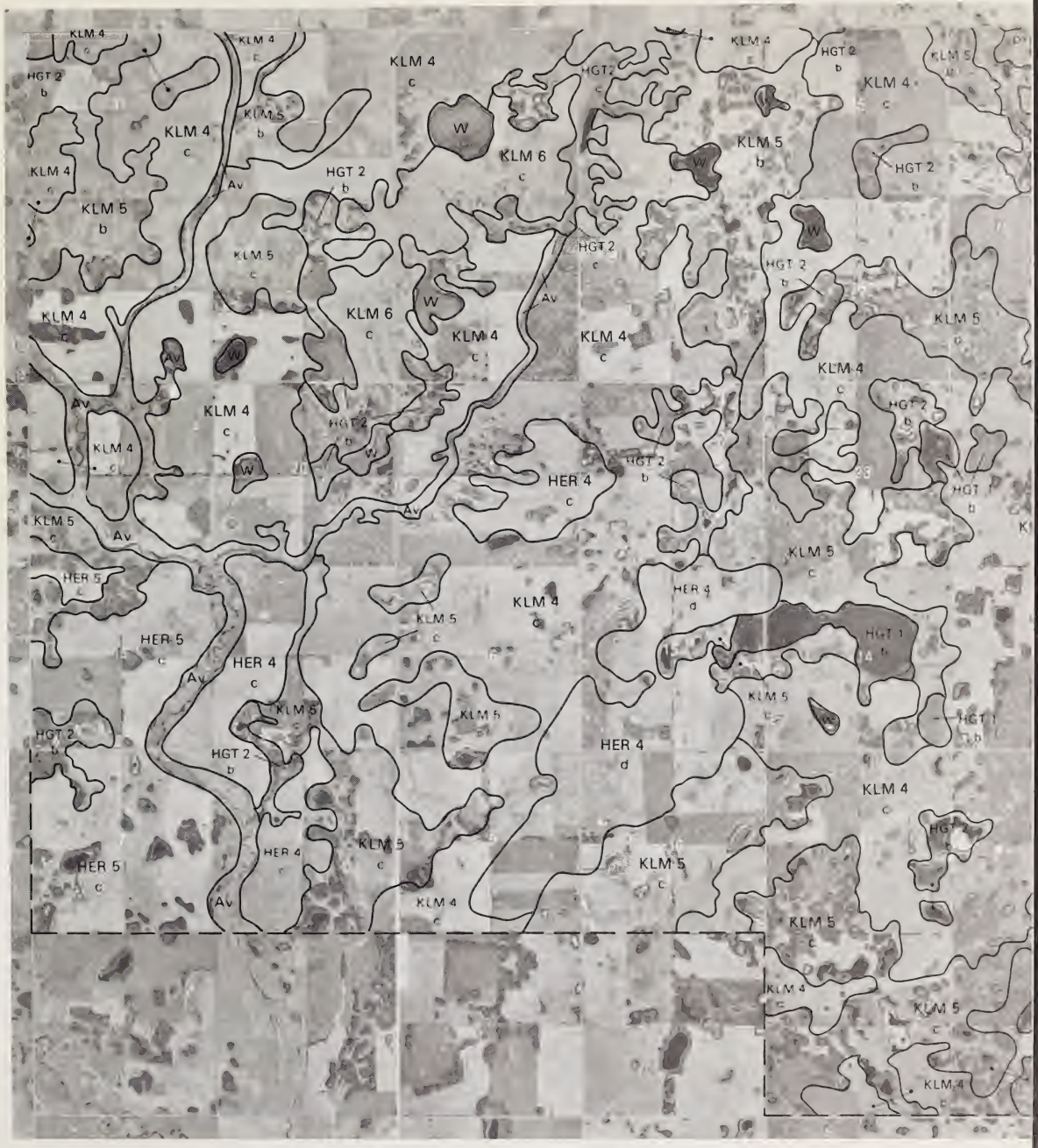
Soil Survey - County of Beaver - Mosaic No.27

R 13

Joins sheet 25

Tp 46

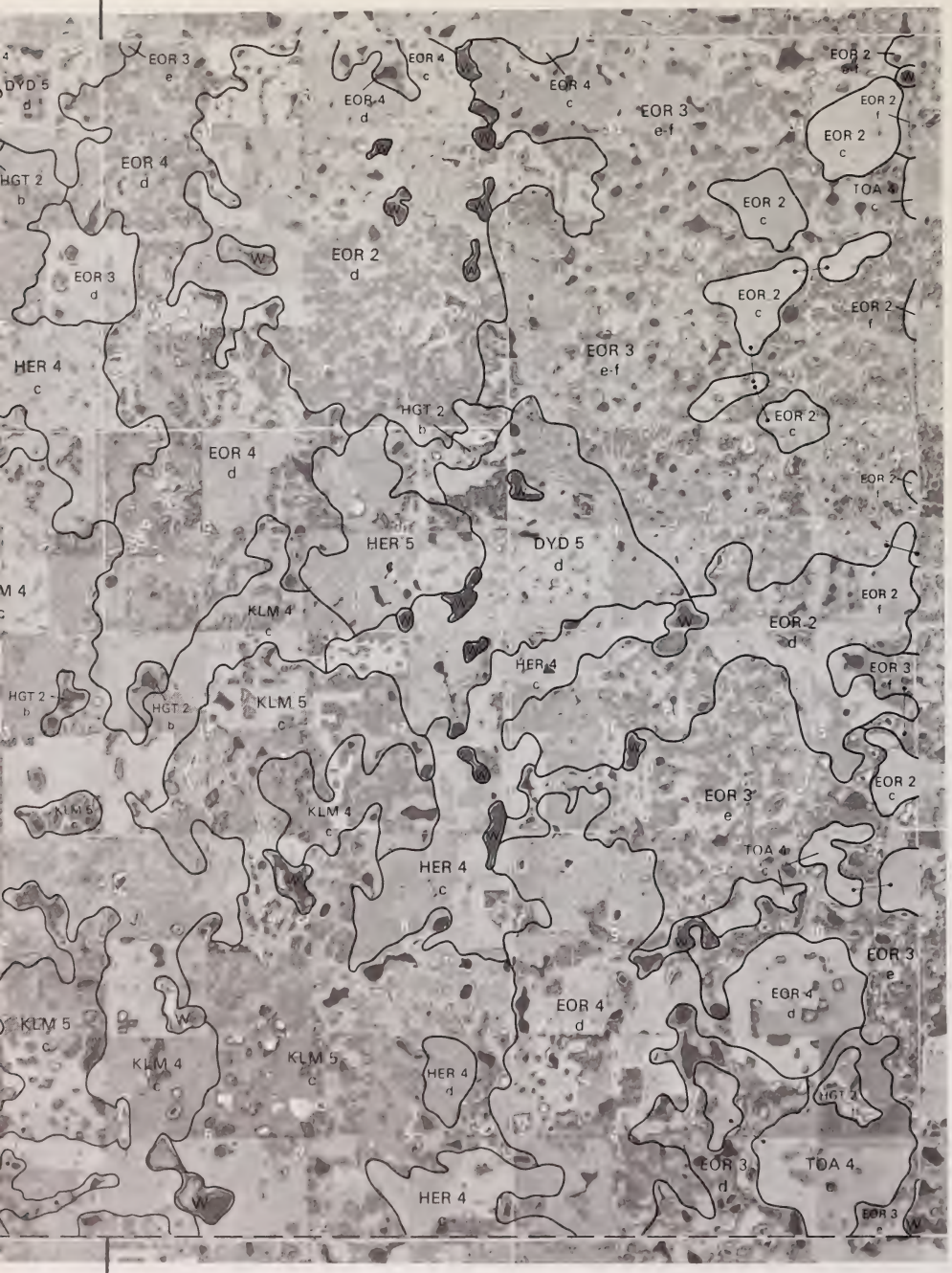
Joins sheet 27



R 13

Soil Survey - County of Beaver - Mosaic - No.28

R 12 W4M



Joins sheet 29

Tp 46

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

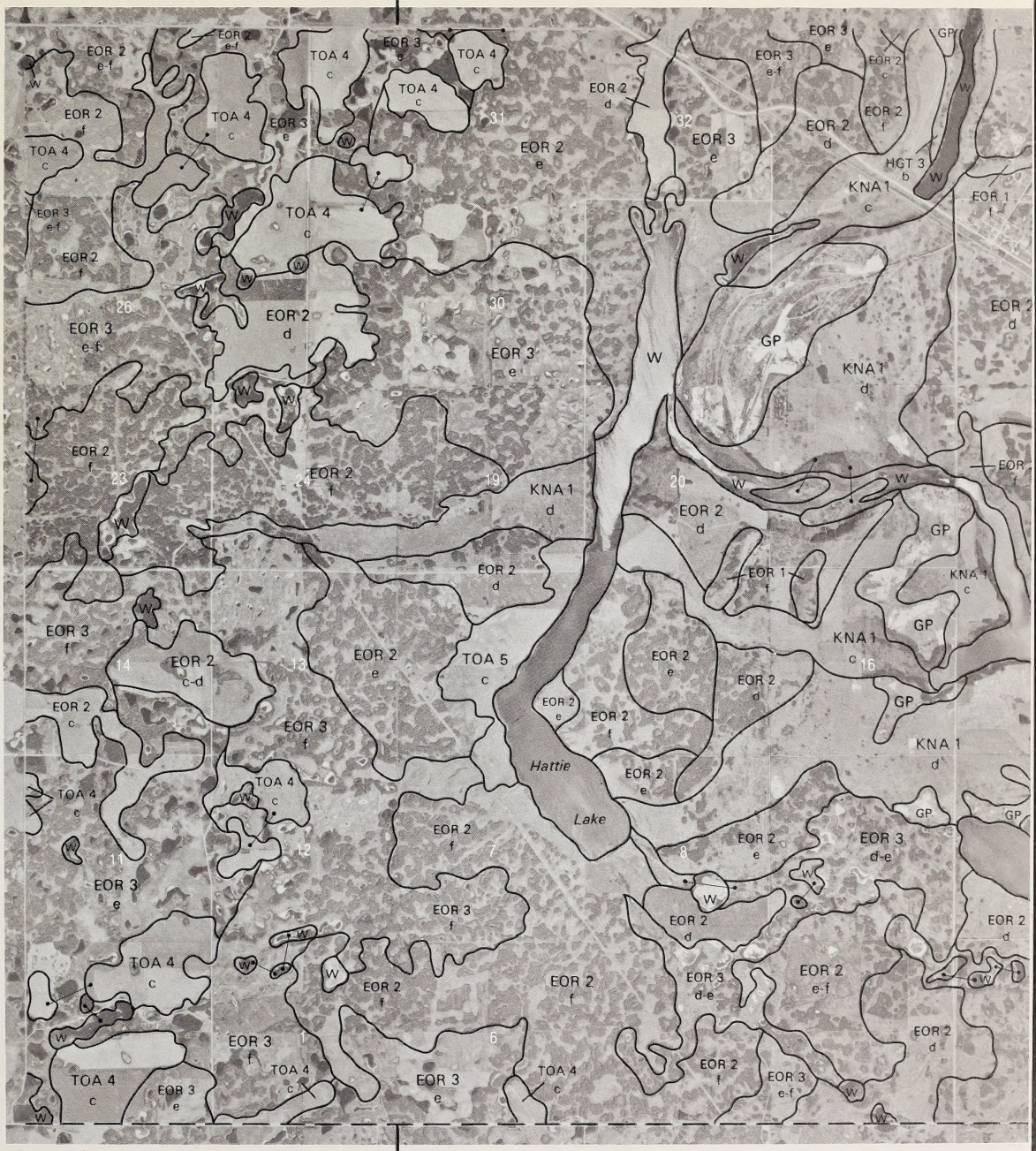
R 12

R 11

Joins sheet 26

Tp 46

Joins sheet 28

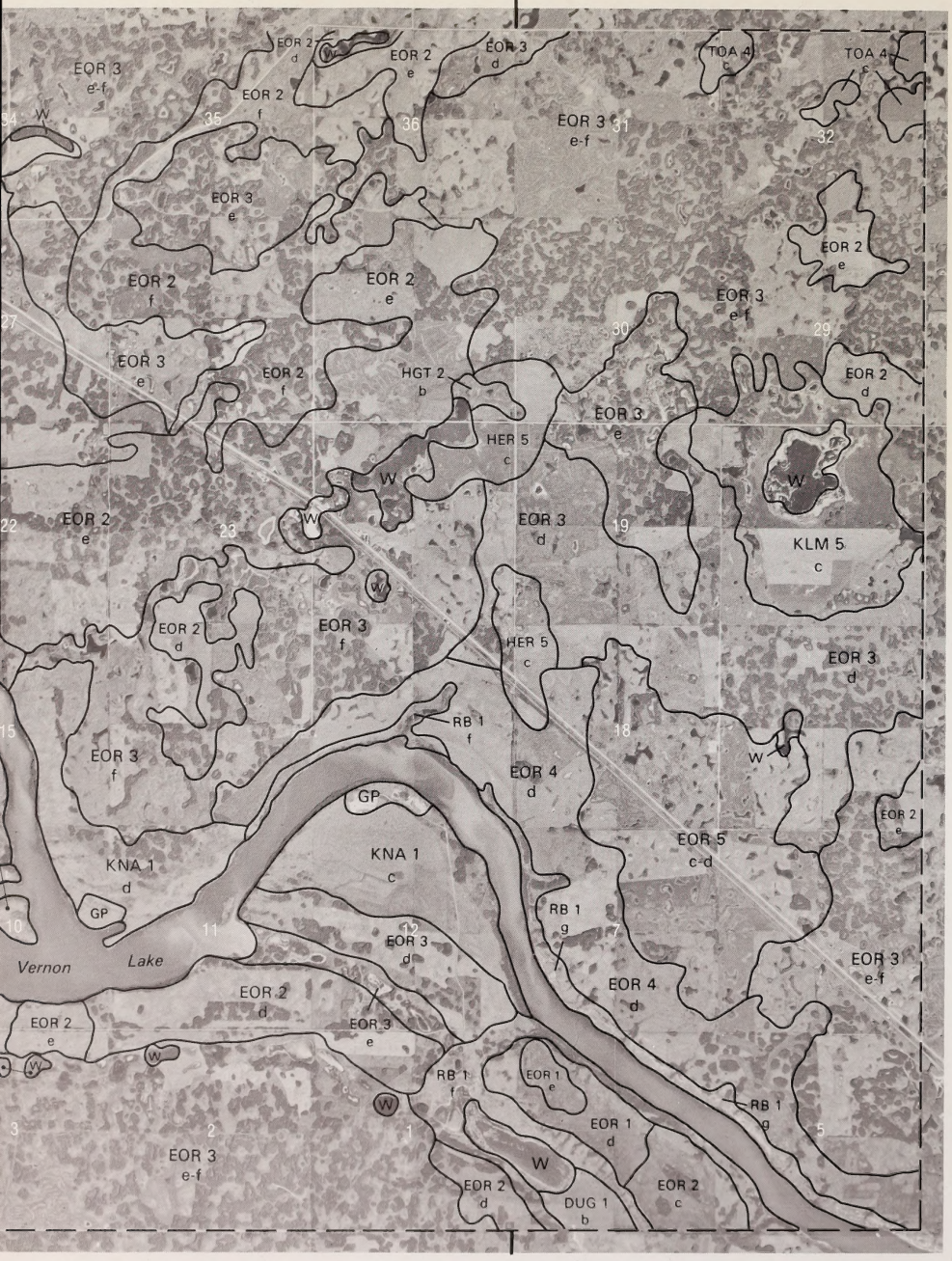


R 12

R 11

Soil Survey - County of Beaver - Mosaic No.29

R 10 W4M



Tp 46

APPROXIMATE SCALE 1:50000

0.78 0 0.78 1.56 miles

1 0 1 2 km

N.L.C. - B.N.C.
3 3286 08724274 5